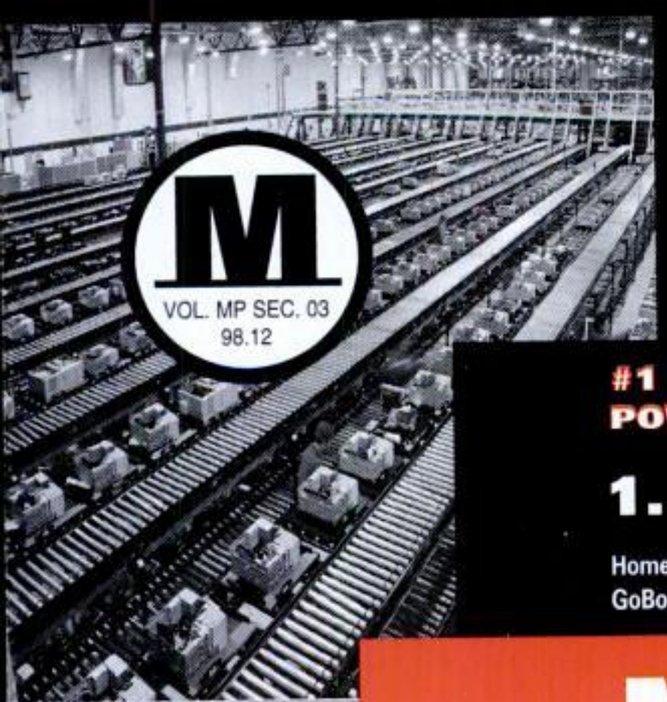


4 OUTRAGEOUSLY OBVIOUS REASONS TO CHOOSE MICRON

#1 RANKING FOR POWER PRODUCTS

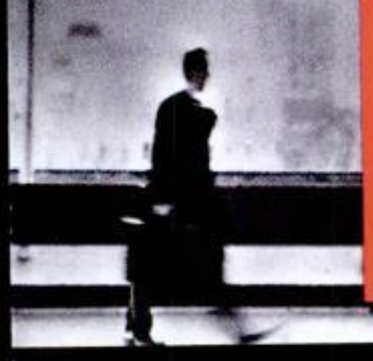
1. Power users have long known that Micron systems are among the absolute best in the industry. The editors of *PC World* Magazine just ranked Micron's Millennia desktop line as the #1 Power Desktop, #1 Home Desktop & #1 Consumer Desktop while *CNET* just named the Micron GoBook the #1 UltraPortable on the market today.

#1 RANKING FOR CUSTOMER SATISFACTION

2. Micron's customers are really satisfied — just ask them. In fact, the influential readers of industry bible *PCWeek* ranked Micron desktops #1 in total customer satisfaction.‡‡ And *Home PC* readers voted Micron #1 in providing the industry's best service and support.

NOW, THE 450MHz MICRON MILLENNIA IS ONLY $1699

(IT DOESN'T GET ANY BETTER THAN THIS)



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"Micron doesn't seem to think that budget-class buyers should be excluded from the new CPU sweepstakes. So the company is offering its new, sleekly designed Millennia 450 at an impressively low price... I was knocked out by the Millennia 450's performance."

- *PC World Magazine*, August '98

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Get More.

"Micron's support policies are first-rate, with a three-year parts and one-year labor warranty and 24-hour toll-free phone support seven days a week."

- *PC World*, "Best Buy," August '98

Get Ahead.

PC WORLD BEST BUY
Millennia 350
Oct '98
Sept '98

PC WORLD BEST BUY
Millennia 400
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PC WORLD BEST BUY
Millennia 450 MAX
Nov '98

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Just named #1 450MHz desktop by the editors of *CNET* and #1 Power Desktop by the editors of *PC World* Magazine (Millennia 400 DVD • October '98, Millennia MAX 450 • *PC World* "Best Buy" November '98), Micron's Millennia desktop product line continues a long tradition of industry-leading, award-winning performance. Perhaps that's why some of the most prominent power users around rely on Micron. No matter how strenuous your demands, no matter how colossal the task, we invite you to put a Millennia® desktop to the test. You'll be hard-pressed to find a Pentium® II processor based system as powerful and affordable as the Micron™ Millennia. And Micron's revolutionary new MPower℠ purchase program makes Millennia ownership even easier, offering qualified users no interest‡‡‡ or payments for six months as well as PowerXchange℠ trade-in options on your current Pentium processor-class PC towards a new Millennia desktop.

6 NO PAYMENTS NO INTEREST 6 MONTH SAME AS CASH OFFER MICRON'S EXCLUSIVE CONSUMER

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A non-refundable up-front freight charge applies for participation in PowerXchange to cover cost of return packaging and processing.

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3. Micron's MPower™ program provides a myriad of flexible financing options including no-interest, no-payments for six months to qualified consumers as well as low monthly payment options on both consumer and business leases. No matter which award-winning system you choose, Micron makes PC ownership a breeze.

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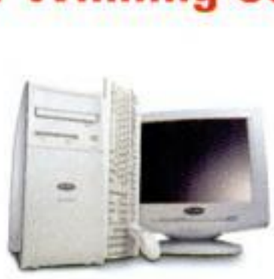

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Model Name	Millennia C333	Millennia 350	Millennia 450	Millennia 450 MAX	Millennia 450 MAX
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Cache	128KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache	512KB internal L2 cache
RAM	32MB SDRAM	64MB 100MHz SDRAM	64MB 100MHz SDRAM	128MB 100MHz SDRAM	128MB 100MHz SDRAM
Hard Drive	4.3GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	8.4GB Ultra ATA hard drive*	13.6GB Ultra ATA hard drive*	14.4GB 7200 RPM Ultra ATA hard drive*
Monitor	15" Micron 500Vx monitor (13.8" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	17" Micron 700Vx monitor (15.9" display)	19" Micron 900Lx monitor (18" display)
DVD/CD-ROM	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	32X max speed CD-ROM drive	4.8X DVD-ROM drive
Modem	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**	3Com/U.S. Robotics 56K WinModem**
Graphics	nVidia Riva 128, 4MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	nVidia Riva 128, 8MB SGRAM 3D AGP graphics	Diamond Viper 550 nVidia TnT, 16MB graphics
Sound System	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound	PCI 64-voice Wavetable sound
Warranty	5-year/3-year Micron Power℠ limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty	5-year/3-year Micron Power limited warranty
Software Included	Microsoft® Windows® 98 Microsoft Home Essentials Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus	Microsoft Windows 98 Microsoft Office 97 Small Business Edition Microsoft Outlook Microsoft Internet Explorer Norton AntiVirus
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Upgrade to:	Upgrade to: 64MB SDRAM memory 6.4GB Ultra ATA hard drive 17" Micron 700Vx monitor (15.9" display) 100MB Iomega Zip drive	Upgrade to: 128MB SDRAM memory 10GB Ultra ATA hard drive 17" Micron Trinitron 700Tx monitor (16" display) 100MB Iomega Zip drive	Upgrade to: 128MB SDRAM memory 13.6GB Ultra ATA hard drive 19" Micron 900Lx monitor (18" display) 4.8X DVD-ROM drive	Upgrade to: 100MB Iomega Zip drive Monsoon MM1000 flat panel speakers w/subwoofer 19" Micron Trinitron monitor (18" display)	Upgrade to: 256MB 100MHz SDRAM Microsoft Natural Keyboard Elite
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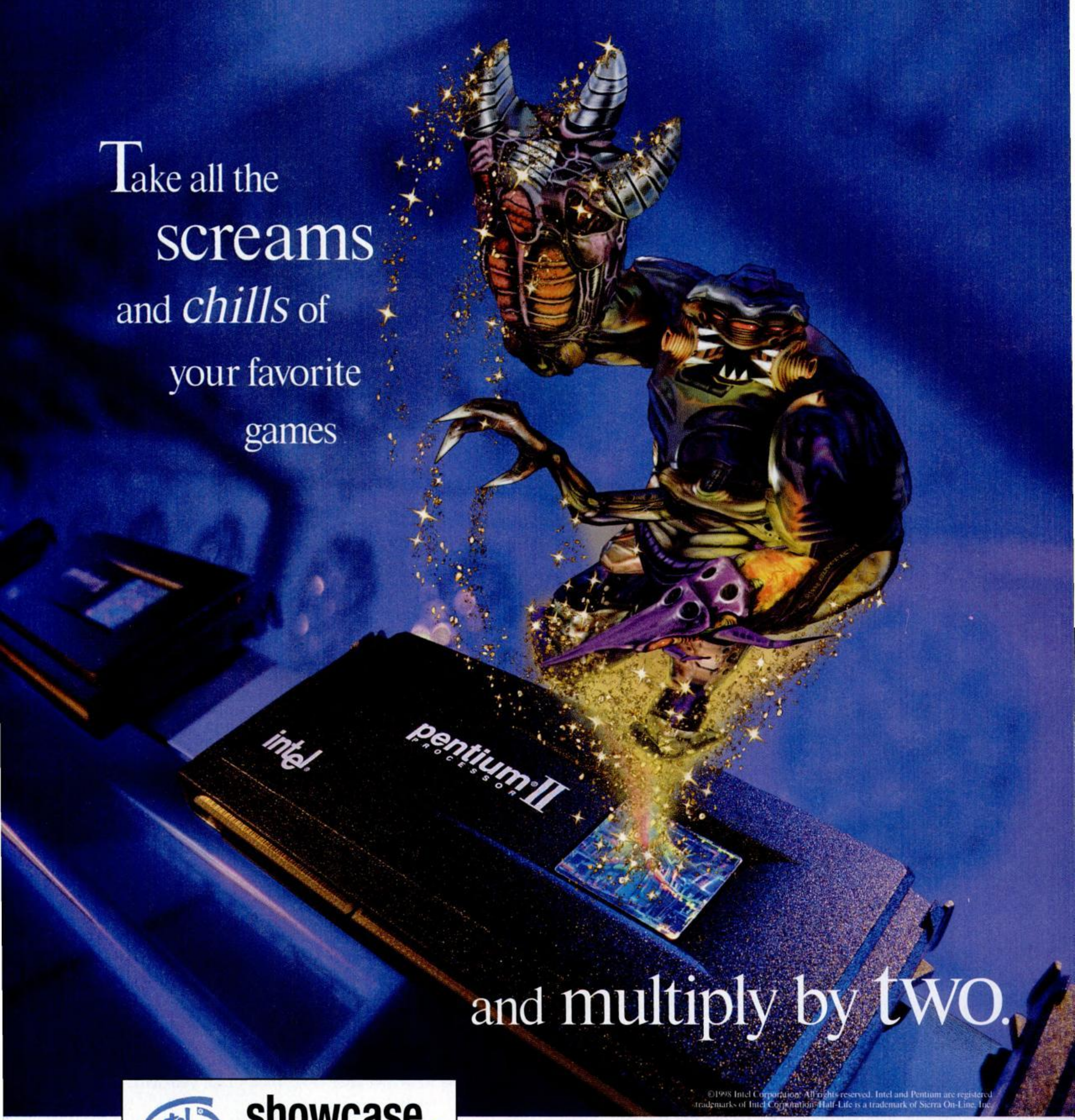
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MAXIMUM PC

DECEMBER 1998

70 Mission: Control ▶
The right game controller can send your win-to-loss ratio into the stratosphere. We've got wheels, sticks, throttles, and gamepads. Even a few funky devices made for Elroy Jetson. Pick one and beat the crap out of your keyboard-loving friends.

44 Interrogation ▶
He may not have the fastest processors in the world, but Cyrix's **Kevin McDonough** is riding high in his belief that the company's forthcoming silicon is spicy enough to force Intel to reach for a tall glass of water.

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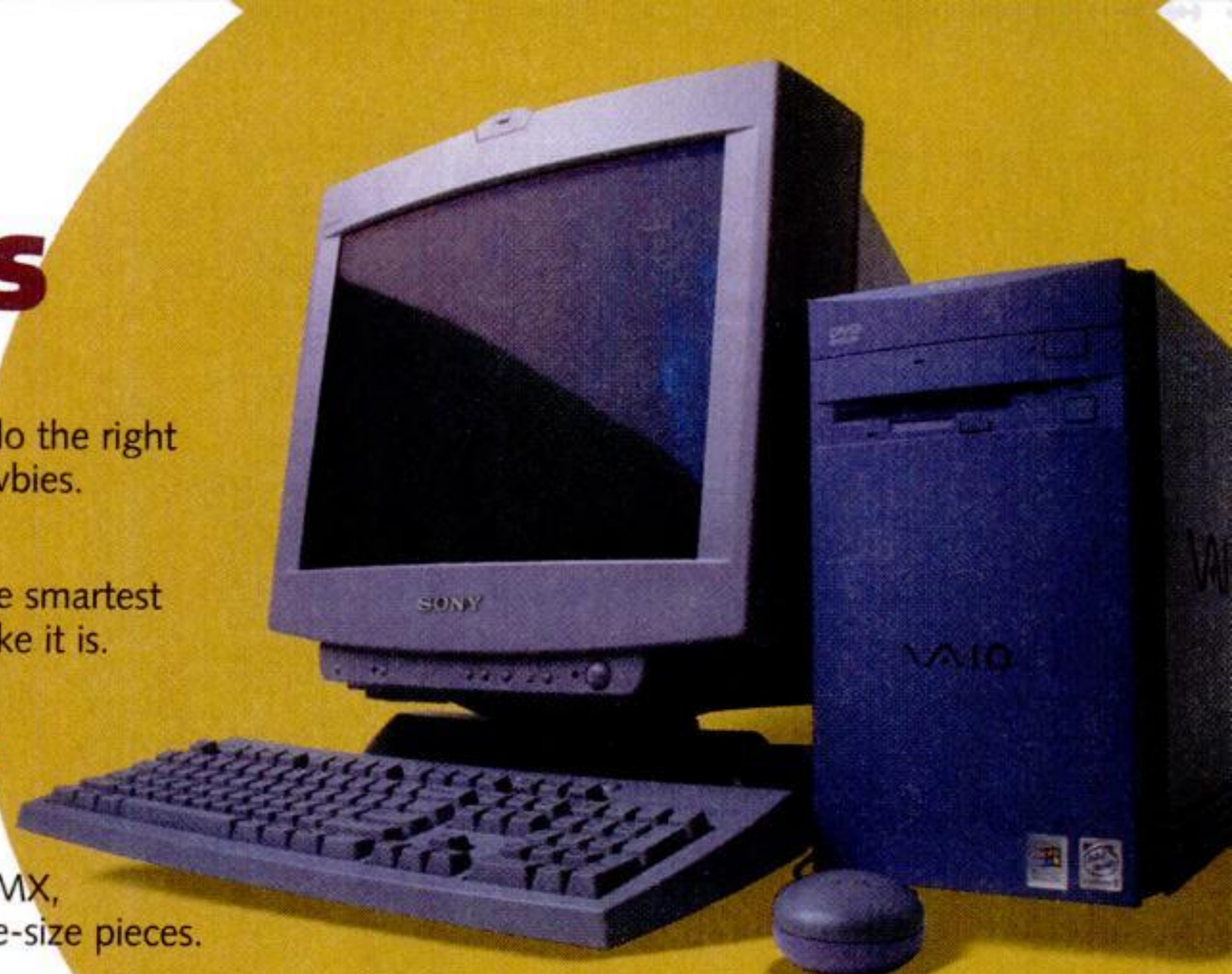

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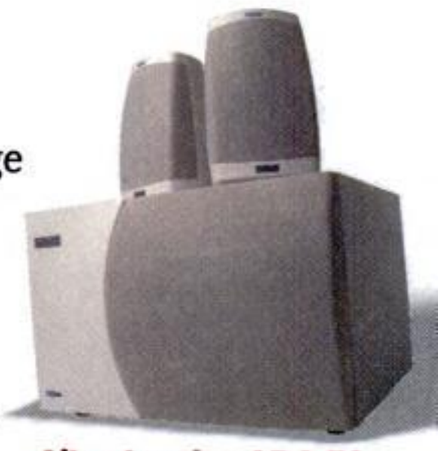
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▶This month **Gateway's Xeon system** kicks some sand, **Banshee**-based vid cards go head-to-head, **Nuts & Bolts 98** fixes whatever ails you, **Illustrator 8.0** draws on experience, **Sony's new VAIO** delivers serious DV horsepower, and games galore—such as **Klingon Honor Guard, Shogo, M.A.X. 2, Total Air War, and Dominion**—run amok.

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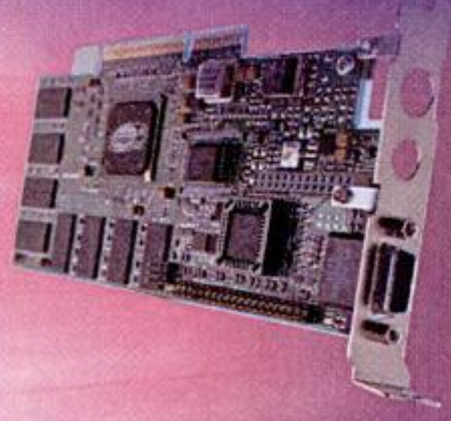

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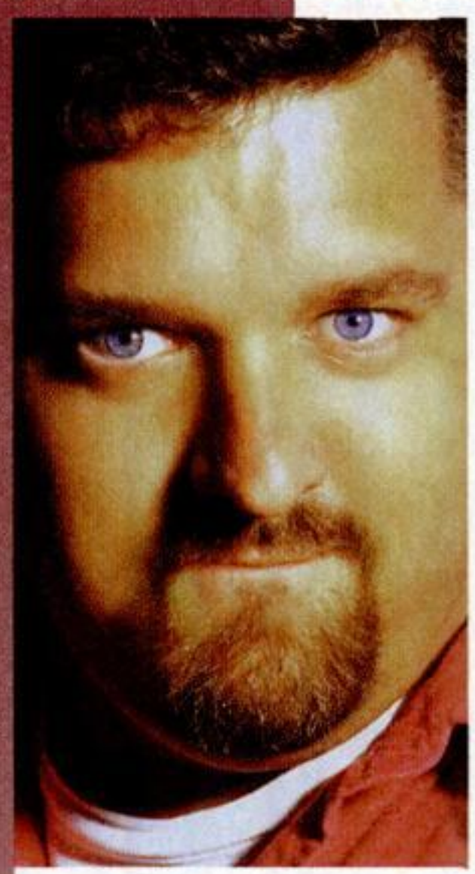
The Only Stupid Question



"Go the extra mile and actually help these people along because it's the right thing to do."

If you're the least bit familiar with *Maximum PC*, you know this magazine is dedicated to getting the absolute most out of the PC experience. We want bigger. We want better. We want faster. And month in, month out, we make the mag that'll get your PC burning rubber.

But what about the newbie who picks up *Maximum PC*? Is this person straight-up SOL? I hope not.

Frequently, in the online forums and computer stores that make up our world, those just entering into the fold are turned upon with impatience and derision. And that's just wrong. Every time a budding PC hot-rodder marches down to his corner PC shoppe and demands a "3Dfx card by nVidia" and is greeted by gales of laughter, or even surreptitious snickers, we run the risk of losing a fellow PC fanatic. And frankly, we can't afford to lose even one.

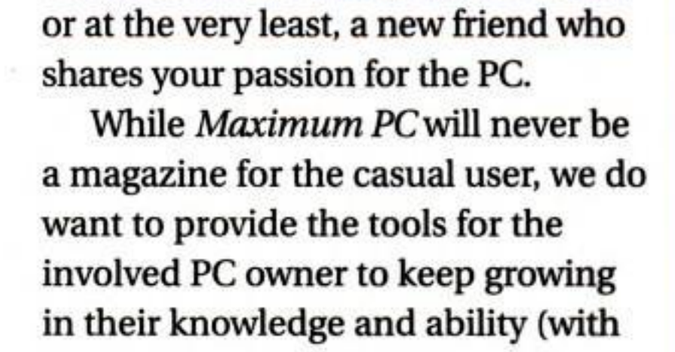
These days, system manufacturers are beginning to think the low-end is a more viable market. Processor companies are looking at the margins for the lowest-common-denominator. And all around, vendors are peddling parts that prioritize performance at the bottom of the list. There very well may be a legitimate business in the PC-as-appliance business ("Honey, can you reboot the microwave? I think it hung."), but all too often this business comes at the expense of the high-end we all crave.

Why are companies that once pushed the envelope now just mailing it in? Numbers. At the end of the day, it's just a business. And every time we Pure PC Power junkies cannibalize our numbers with cracks aimed at our green brothers-in-arms, we diminish ourselves in the process.

This is not to say the only reason you shouldn't ridicule a fresh face is to protect our precious visibility in the eyes of the industry. No, you should go the extra mile and actually help these people along because... (say it with me) it's the right thing to do.

Every single one of us begins any venture as a novice. I still painfully remember buying my first SLR camera and asking if it worked with both color and black-and-white film. Even though the guy I'd asked was my best friend, he rolled on the floor laughing at the question. And I felt like a big doof. But he pulled himself together and explained to me how the physics of light operate and how cameras employed those laws, and I went on to work for daily newspapers as a photographer during college. His patience with this, and future stupid questions, allowed me to get into the journalism field (and eventually migrate to this gig). The time you set aside to explain the difference between frontside and backside cache to a CPU virgin may eventually lead to the next *Maximum PC* editor, or at the very least, a new friend who shares your passion for the PC.

While *Maximum PC* will never be a magazine for the casual user, we do want to provide the tools for the involved PC owner to keep growing in their knowledge and ability (with sections such as the Terminator). And we're always into hearing your suggestions to make this experience even more fulfilling, so never hesitate to fire off your questions to me directly at **editor@maximumpc.com**. We'll answer as many as we can fit in the magazine, and also send as many direct replies as time allows... even for those most basic questions, such as "What's the 'P' stand for in PC?"



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Editor in Chief

MAXIMUM PC

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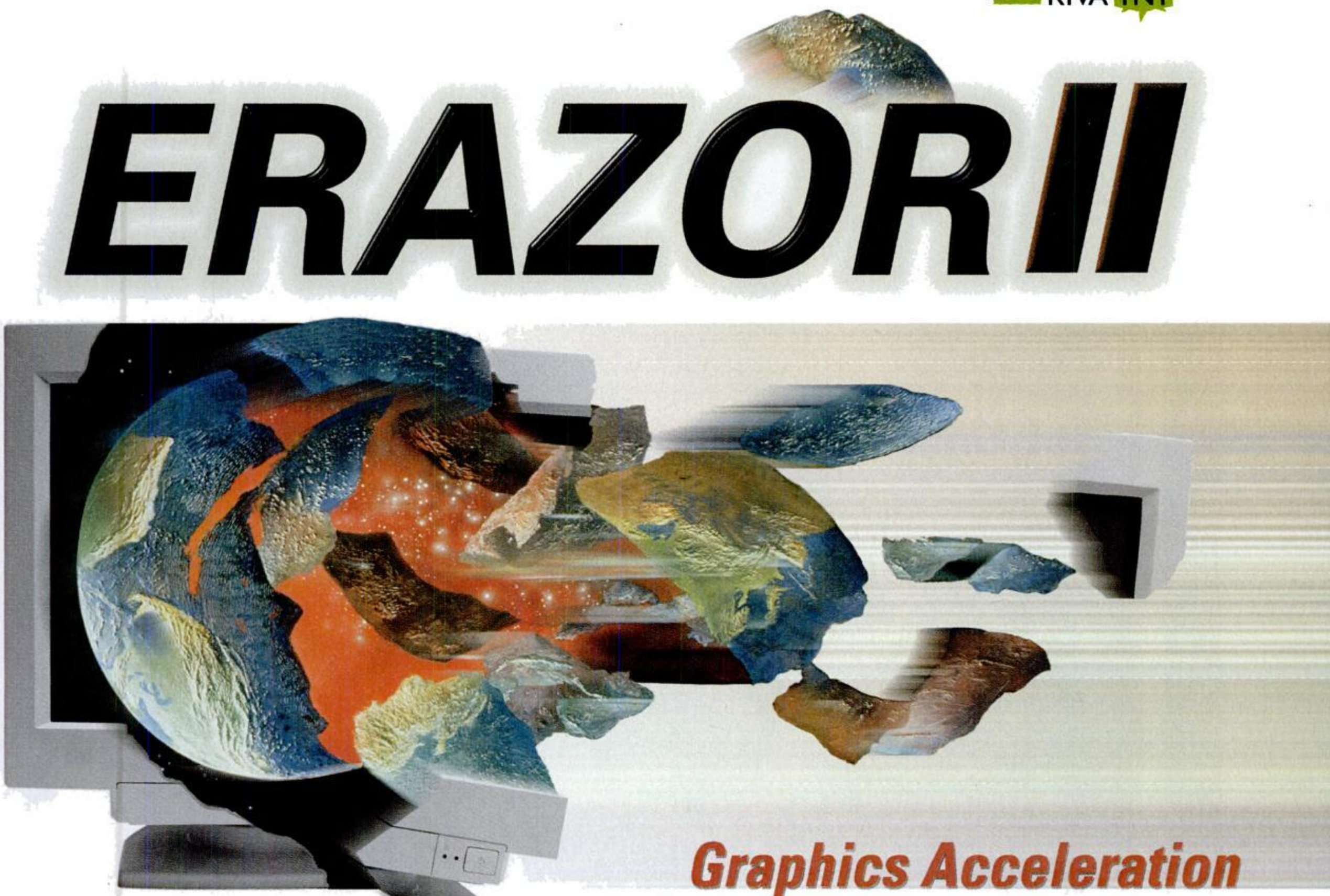

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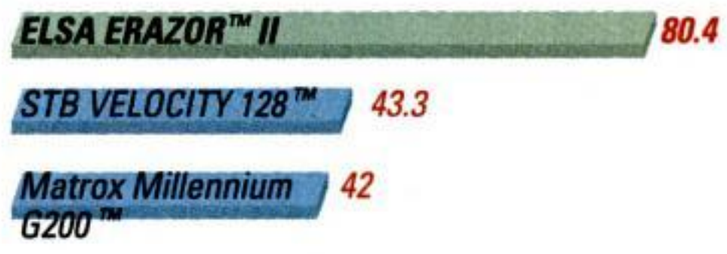

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All tests in FPS. All cards run with vertical sync off. All cards tested on an Intel dual Xeon with 256MB RAM running Windows 95 with DirectX6.

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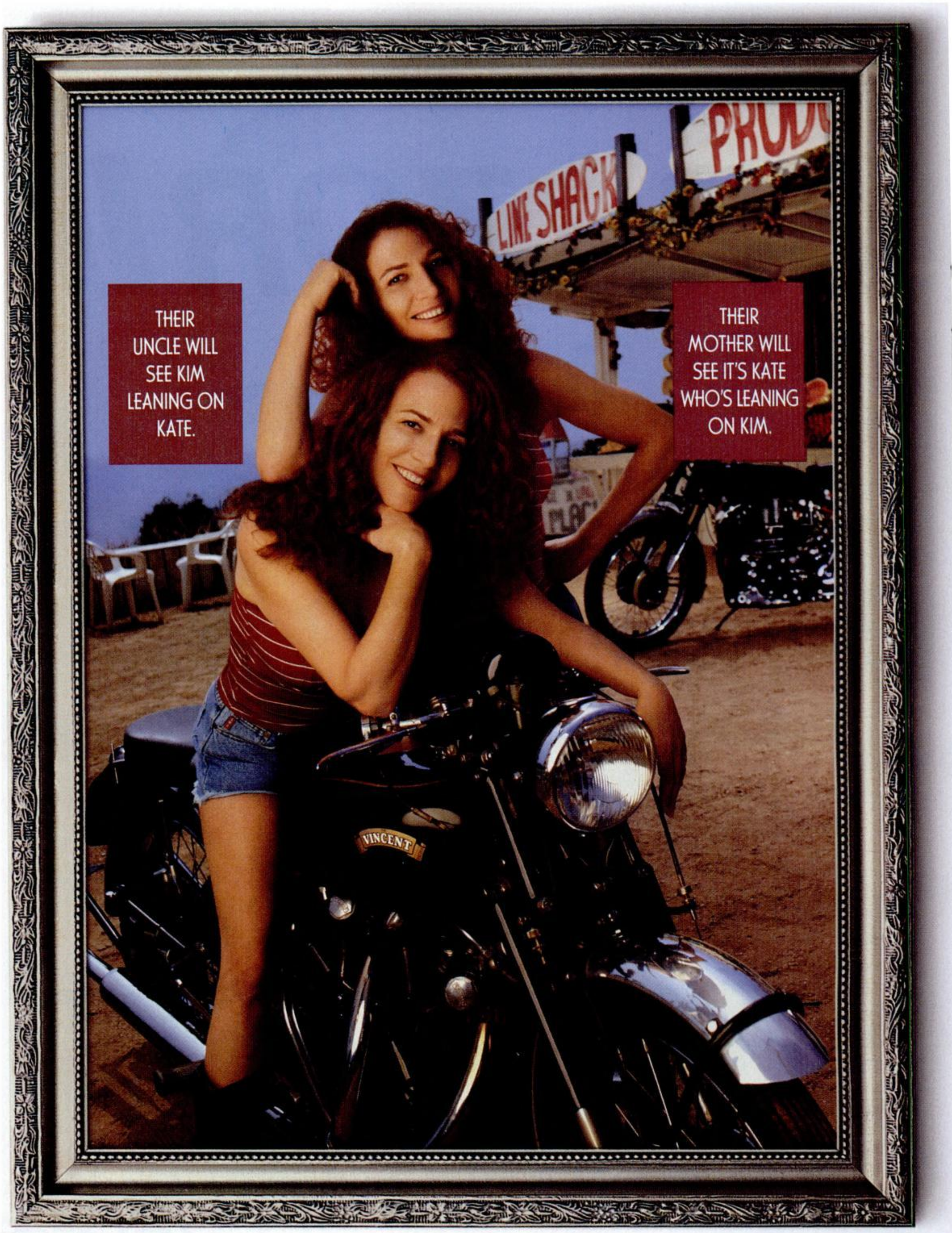

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COMMPORT

Letters from the Smartest Readers in the World

Here's the deal: You (being the smartest readers in the world) write letters about the magazine, the PC industry, the software you love or hate, and the hardware that runs it. We read it and share as much of it as space permits in the mag and online, and respond or comment when the letter calls for it. Get it? Now get busy and write us at **commport@maximumpc.com**

This month:

- **Bonded modems deliver faster online access**
- **Whither PCI?**
- **Win a Mac keyboard and mouse**
- **Katmai Kometh**

U.S. Out of Redmond

I abhor the federal government's intrusion into the computer industry vis à vis the Microsoft (and Intel) suits, but I'm not going to go into a lengthy rant. A few points need to be made concerning "Feds Go on the Offensive" (Sept. 98).

One, I do not want the Luddite Ralph Nader anywhere near the computer business. He certainly has never spoken for this "consumer."

Two, his frontman James Love clearly knows next to nothing about computers or the industry. Like so many of Nader's frontmen in other industry agitation groups, Love seems to live in his own world and wishes to impose that view on everyone else, whether they want it or not. Linux may be "cool," but unless it changes greatly and quickly, it's no threat to Windows for several years. And his prognostication that PCs will be shipping some unnamed, "different" OSes in the next year is just goofy. If Love really believes that, then why is he so gung-ho to have the Feds dismantle Microsoft?

The truth is that the Microsoft/ Windows hegemony will eventually be supplanted by something else in a few years. The reason isn't because Microsoft is evil, it is simple market dynamics. Windows is aging fast, but Microsoft has to defend it as it has been defending the DOS and 3.1 legacy products. IBM had to defend the mainframe and never quite grasped the PC revolution (at least until recently); Commodore and Atari defended their systems and went the way of the Stanley Steamer; Apple defended its high-profit business model/ closed-app system and almost faded away. All were surmounted because the market changes. Standards are always supplanted and Microsoft (or rather Windows) will be too. Likely by 2005 there will be another OS (and then another...), it won't be Apple and probably not a Microsoft/Windows derivative product, but something different, something that might only be on a drawing board now. Please, let the market (we computer users) decide this, not self-appointed "consumer" activists or the government.

—Brett Moss

"The truth is that the Microsoft/ Windows hegemony will eventually be supplanted by something else. The reason isn't because Microsoft is evil, it is simple market dynamics."

Shotgun Wedding

I read an article about hooking two modems up together in "sync" to get double the speed. I know you must have two separate phone lines and an IP carrier that allows dual logons, but beyond that I'm lost.

—Satchman

Online Editor Gordon Ung replies: Multilink or bonded modems essentially combine streams to increase speed. Windows 98 offers native multilink protocols, and there are several products out there to choose from. In the mainstream, there's Diamond Multimedia's Shotgun modem, which bonds **two** 56K streams into one. The Shotgun requires that you use an ISP that supports it, such as Netcom. For manic modem madness, Amquest sells its Quad Modem, which bonds four 56K V.90 streams into one. The Quad Modem is a full-length PCI card, but occupies only one IRQ for the modems. The Quad Modem will also let you dial up different ISPs that don't support it, unlike the Shotgun.

PCI: The Forgotten Bus

It bugs me how quickly the industry forgets old technologies. Case in point: AGP videocards.

Although AGP has only been available for about a year and there are still many potential buyers of PCI videocards, companies seem to have forgotten about them. Recently I wanted to upgrade my Diamond Stealth II S220 and was shocked to find that of the 10 local stores I called, none stocked PCI versions of the videocards. They could special order it at an added cost. Also, new videocards coming out these days are AGP-only. For example, the Intel 740 was AGP-centric until Real3D went rebel and made a PCI bridge chip (bravo!). And as far as I know, the Matrox MGA-G200 is AGP-only.

I love new technology—I wouldn't be reading Maximum PC if I didn't! But should the industry forget about legacy customers so quickly, especially in the case of AGP, since so few games take advantage of it?

—Bidroc Darkbringer

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Editor in Chief Brad Dosland replies: In a perfect world, no platform would ever be left behind. But in the real world, both customers and manufacturers invariably migrate to new (and improved) technology, which is both unfortunate and fortunate. Some killer tech still resides on the PCI bus (such as 3Dfx's Voodoo² architecture), but the new breed of hot 2D/3D cards are AGP for the most part.

Make Mine Mac

Two questions:

1. Is it just me, or is that an X-ray of a Mac keyboard and mouse on page 113 of the first issue?
2. If I'm right, do I get a prize?

—John Biehler

"It bugs me how quickly the industry forgets old technologies. Case in point: AGP videocards."

Editor in Chief Brad Dosland replies: You're right! And for being the first to spot the snafu, you win a Macintosh-compatible keyboard and mouse! Congratulations.

Build a Better Mommy

Your article on your Dream Machine was indeed Kick Ass! But I have a problem with your recommendations for a budget motherboard. The FIC 2013 lacks some important items compared to the Epox EP-51MVP3E-M:

1. The Epox CPU range goes up to 500MHz, whereas the FIC goes to 350MHz.
2. The Epox provides three DIMM slots plus two 72-pin slots, whereas the FIC only has three DIMMs. Plus, the Epox allows you to use PC100 RAM with your existing EDO RAM without hindering performance.
3. The Epox uses an Award BIOS, which provides several features that come in handy, such as CPU temp, USB support, and many standard features. Compared to FIC's APM BIOS, the Epox is more overclock-savvy.
4. Performance! I believe the Epox setup with an AMD K6-2 300 and 128MB PC100 SDRAM ran Win98 and gaming apps better than the FIC board. I've installed both the Epox and FIC boards, and I conclude that the Epox gets more bang for the buck!

—Marty

The Price of Porn

I read Shel Kimen's column on porn in the inaugural issue and decided I'd check out a few sites. Of the ones I accessed, all of them barked about free membership, generally for a three-day period. You have to read the fine print carefully, and usually have to go to other than the steamy screens to find the "terms and conditions," which you'd better check out. These give the terms of payment and conditions for canceling.

Even so, all five I accessed—and cancelled either during the session or within one day—charged my credit card with a $30.00 charge. So if you don't want a charge to appear on your bill, don't enter your card number and don't enter the sites. The free membership is, as you state, BS.

Four of the charges on the card had 800 phone numbers, and the customer service representative readily cancelled my membership and assured me that my card would be credited. One charge had no phone number, but they had a web site (not indicated on the bill) where you can cancel and send comments about requesting the charge be withdrawn. It is also a good idea to send a letter immediately to your card company and certify that you have not made the charges or utilized or received any services.

—Francis

P.S. You were right about needing a fast machine. These guys do have some goodies that require one, especially for streaming video.

Virtual Murder

In the letters section of your October issue, reader "Bonnie" offers her judgement that online porn is bad, because "fantasizing about other people is still adultery and fornication." If thinking about having sex with someone other than one's spouse is adultery, then I suppose someone who fantasizes about murdering his or her boss is a murderer. To take this logic further, if fantasizing about murdering people is still murder,

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then most PC gamers are murderers. In the future, perhaps you should only review games such as *Putt Putt Goes to the Moon*, in order to spare your readers' eternal souls.

—Allen Murdock

K is for Katmai

After reading your interview with AMD's second in command, Atiq Raza (October 1998), I was left with some questions unanswered about the K7. First, will the K7 have the Katmai instructions? It seems a no-brainer for AMD to use them, if they can. With the K7 supposedly running at above 500MHz with improved floating point and using a 200MHz front-side bus, it looks like it could outperform Intel's Katmai chip or possibly even the Xeon, which if I remember correctly will run a 133MHz FSB.

And secondly, if they aim the K7 at the server market, will we be able to have a dual-CPU motherboard? Also if there is a 200MHz motherboard in the works, what type of memory will it be using? Rambus, ESDRAM, Virtual Channel SDRAM, or maybe 30-pin fast-page mode DRAM?

—Paul Karlson

Executive Editor Jon Phillips replies: We just met with AMD at the Microprocessor Forum, and the company said it has no plans to include Katmai instructions in the K7 when the processor launches in the first half of 1999. As it stands, Katmai is still beta-testing with select developers, so it's not a licensable product that AMD can play with and integrate. Even more pertinent, AMD is betting that Katmai-laced CPUs will launch on the server/workstation high-end, and regular-Joe consumers won't have the jingle to buy Katmai processors until late 1999. This means game developers won't have to care about Katmai support until that timeframe as well—which is good news for AMD's 3DNow! instructions. Time will tell if AMD's supposition is correct. AMD added that 3DNow! is a big hit with new computer buyers and game developers, and is enjoying an inertia that should continue through 1999.

Our take? At some point, Katmai will become just too significant, and AMD will indeed license the first new registers to be added to the x86 architecture since 1985. It's simply a matter of being x86-compatible. When we met, AMD didn't rule out Katmai, and history reminds us that the company licensed MMX instructions in 1997.

K7/Slot A is indeed a multiprocessor proposition, though it's being launched from the get-go for high-end desktop PCs as well. No word yet on memory requirements, though we were relieved to learn that AMD will be making its own core-logic chipsets to ensure stability for all its grand designs, including that rip-roaring 200MHz system bus and L2 cache amounts of up to 8MB.

Xeon processors are currently spec'd to run on a 100MHz system bus, but some motherboards allows bus speeds up to 133MHz.

"If thinking about having sex with someone other than one's spouse is adultery, then I suppose someone who fantasizes about murdering his or her boss is a murderer."

Let's Do the Time Warp Again

Not that it really matters, but why does my premiere issue (September 98) have Vol 1 No 1 on the binding and the second issue (October 98) have Vol 3 No 9?

—Alex

Managing Editor Sarah Pirch replies: Due to a glitch in the space/time continuum, time moves much slower in the *Maximum PC* office than in the outside world. That's how so few of us get to see so much cool computer stuff. And that's how we were able to produce an issue a day during the entire month of August. That's 31 issues. At twelve issues per volume, you see how we got to Vol 3 No 9 so quickly.

For those to whom it really matters, like librarians and persnickety readers, we continued our volume numbering where *boot* left off (at Vol 3 No 7). In the first issue of *Maximum PC*, the incorrect volume numbering on the side was due to a production error.

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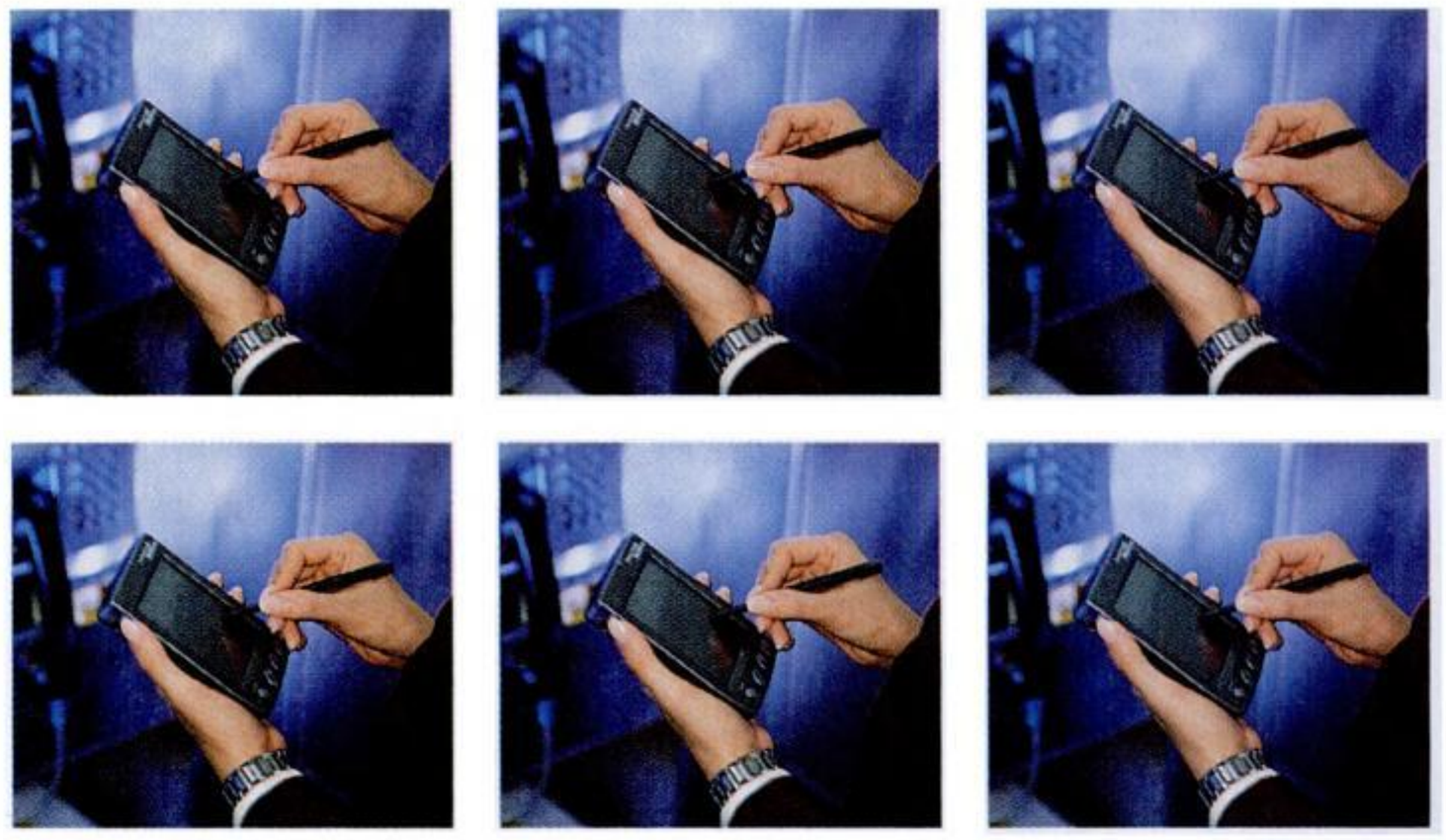

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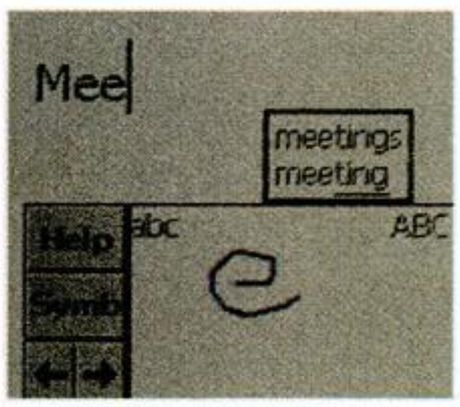

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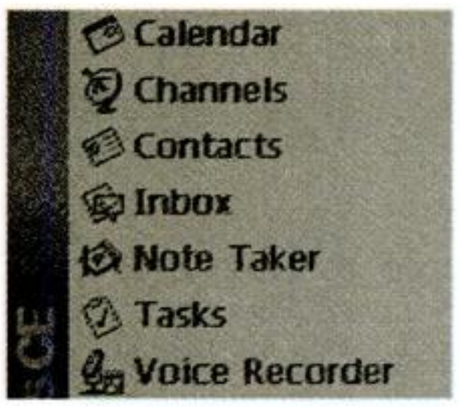

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special investigation ► reader alert

Computer Slack

Consumers allege mail-order rip-off

It was too good a deal for Milton Toorans to pass up.

For a mere $74.95 membership, Arizona-based Computer Shack promised rock-bottom dealer prices to consumers who enrolled in the club.

"Not only do we sell systems, but we also sell printers, scanners, software, multimedia systems, and basically anything you could ever want or need for your computer—all at discounts up to 90% off retail prices," proclaimed company President Andrew Roth on his web site at www.insiderscompworld.com.

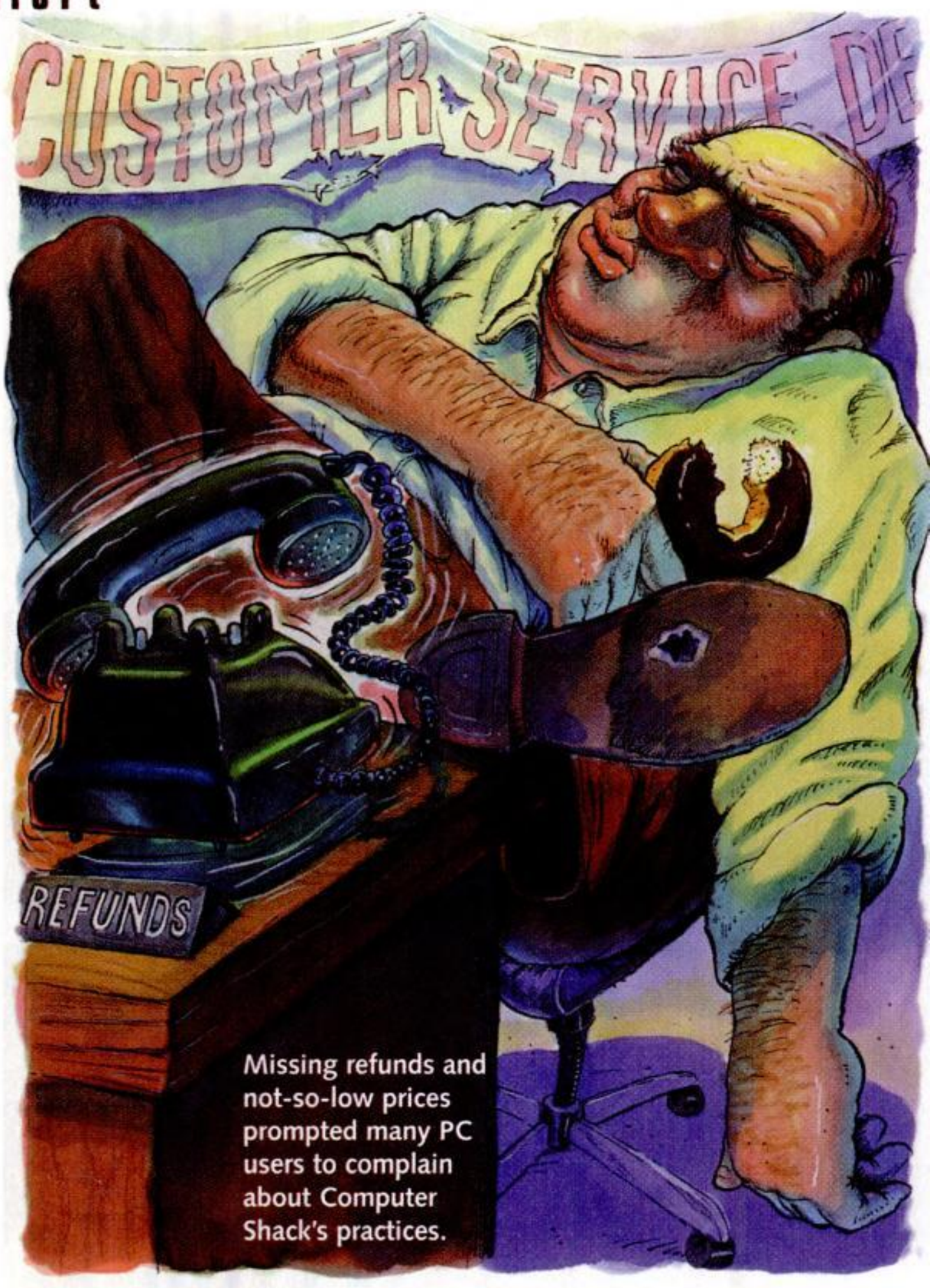
Toorans was skeptical at first, but the promise of a full refund for the unsatisfied sealed it. What Toorans received in the mail was a generic catalog of PC equipment, a photocopied ID card with the lifetime-membership number of 1974 on it, and the "exclusive" dealer list prices. But none of the prices met his expectations.

"The prices from Computer Shack were higher than local prices, so I called the company for a refund. But no money has been refunded," Toorans said.

To add insult to injury, every customer had a charter "lifetime membership number" of 1974, according to a former employee.

The company, which is also known as Insider's Computer World, has had a long track record of problems with consumers, earning an "extreme caution" classification from the normally neutral Better Business Bureau.

"The Bureau has received numerous complaints alleging delayed or nondelivery of the membership packet and merchandise, poor customer service, and failure to refund," the BBB report says. To make matters worse, consumers who did receive refunds couldn't cash the checks because they were issued on a closed account.



Missing refunds and not-so-low prices prompted many PC users to complain about Computer Shack's practices.

The BBB says that although Computer Shack/ Insider's Computer World addressed some complaints, many more remained unanswered or unsettled. This led the Bureau to conclude that: "Based on the nature of this company's offers, the lack of background on the owner(s), and the pattern of failure to settle complaints, the BBB Phoenix advises extreme caution."

Maximum PC's requests to speak with the president of the company were refused, but an employee who identified himself as Ramsey Garcia, a manager at Computer Shack, did try to answer some of the criticism. Garcia said the BBB's records of threats from

ILLUSTRATION BY SCOTT PECK

SPIN CYCLE

This month's top stories broken down ►

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
nVidia Accuses 3Dfx Of Misleading Consumers	Software retailers are slapping stickers on certain 3D-accelerated games insinuating 3Dfx's products are required for use. nVidia says 3Dfx is misleading consumers.	The problem: Some games stickered with a "3Dfx required" or "3Dfx enhanced" are actually Direct3D- or OpenGL-compliant and work with other cards.	"Titles such as *SiN* and *Motocross Madness* are labeled '3Dfx Required' even though they fully support Microsoft's D3D or OGL," said nVidia's Andrew Logan.	We smell a rat. Telling consumers that a D3D- or OGL-compliant game requires a 3Dfx card is just wrong. Do your research about a game before believing a box sticker.
Creative Sues Aureal—Again	Creative Labs has sued competitor Aureal for allegedly false advertising and spreading misinformation about Creative's Sound Blaster Live! soundcard.	The suit charges Aureal with using false information in a chart comparing Live! and Aureal's Vortex 2–based products. Aureal officials say the data came from Creative.	"They've published misleading statements in the past," said Aureal's Brendan O'Flaherty. "If we ran to a judge each time, no would have time to develop products."	While tech companies deserve the right to protect their intellectual property, Creative's latest suit makes it seem like a whiner, not a winner.

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Insider's Computer World customers were the result of some bad workers the company has since fired.

"We had some people who were doing some pretty crazy things on the phone. Their job was to take cancellations," Garcia said.

Garcia also said the high prices Toorans received were the result of different prices customers have access to in different parts of the country. Better prices were available on the updated price list on the company's web site, Garcia said. And what about those "numerous" complaints to the BBB about not receiving product they ordered and paid for? Garcia said those were the result of a person in the warehouse who was "laxing" off.

Maximum PC checked some updated prices on the company's web site in early October. Computer Shack's price for an Epson 700 printer? $279. The Shack's price on a 3Com PalmPilot Pro? $369. We compared these "dealer" prices to CompUSA's web site prices and found the Epson 700 selling for $249 and the Palm Pilot Pro for $299.

Garcia further attributed problems to a merger between Computer Shack and Insider's Computer World a few months ago. He said Computer Shack was an incorporated entity in Arizona and maintained Andrew Roth was the president.

"Refunds were issued, but the tactic was to stall people as long as possible in hopes they would give up in frustration,"
—former Computer Shack employee

Maximum PC was unable to find any records of Computer Shack registered as a corporation with the state of Arizona or county of Maricopa, but did find Insider's Computer World registered to a Michael Consoli, who would not return our calls.

Toorans isn't the only one to have a run-in with Computer Shack. Computer salesman Jay Lamberth began following the company after receiving mail touting unbelievable killer deals.

Lamberth set up a web page on Insider's Computer World and Computer Shack (www.taosnet .com/swbus/fyi.htm) and began getting more than a thousand hits a month. He heard from thousands of people, many of them disgruntled customers.

All Computer Shack members were assigned the same membership number.

"It was all the same thing," he said. "Customers sent in their money requesting one of the gifts and instead got a coupon for saving 10% off their next system purchase. I'm not sure I even remember anyone who actually received a refund."

"Refunds were issued, but the tactic was to stall people as long as possible in hopes they would give up in frustration," said a former employee who wished to remain anonymous. "They refunded a lot of people, but they took their time doing it."

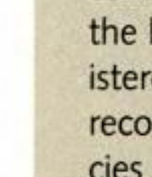
Maximum PC attempted to contact Computer Shack again, but we could never reach a live person. However, after reaching another number for Insider's Computer World, an employee answered that the company was now called CD-ROM Club. The "new" company hawks CDs at its web site: 498CDROM.COM.

"Problems with buyers' clubs are not new," said Susan Grant of the Internet Fraud Watch Program. "Unless a company is already established with a really good reputation for the quality of products and services that it provides, it's a risky way of buying something," she said.

U.S. Postal Inspectors are asking anyone who has had problems with the company to contact them at P.O. Box 20666, Phoenix, AZ, 85036-0666.

As for Toorans? He's still waiting for his refund. ✹

The National Consumers League's tips to avoid getting burned on the Internet:



- ▶Understand the offer. Look carefully at the information about the products or services offered, and ask for more information, if needed. A legitimate business will be glad to provide it; a fraudulent telemarketer won't.
- ▶Be sure you know what is being sold, the total price, the delivery date, the return and cancellation policy, and the terms of any guarantee. Goods or services must be delivered by the promised time or, if none was stated, within thirty days.
- ▶Check out the company's track record. Ask your state or local consumer-protection agency if the business is licensed or registered. Check for complaint records with consumer agencies and the Better Business Bureau in your area. A lack of complaint record is no guarantee of legitimacy.
- ▶Never give your bank account numbers, credit card numbers, or other personal information to anyone you don't know or haven't checked out. But if you have a choice between using your credit card and mailing cash, check, or money order, use a credit card. You can always dispute fraudulent charges.
- ▶High-pressure sales tactics are often danger signs of fraud.
- ▶Sometimes friendly people are crooks!

to the pertinent details.

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
Modem Maker Files For Bankruptcy	For the second time in three years, Hayes Corp. has filed for Chapter 11 bankruptcy. The company plans to continue operations while it works out a reorganization plan.	The company is negotiating to secure permanent financing in the hopes that it can continue to develop its analog, broadband, RAS, and voice-over-IP markets.	"The Chapter 11 filing will allow [us] to meet the needs of our marketplace, serve our customers, and continue developing technologies," said Hayes' Ron Howard.	Dennis Hayes was the father of modem communications, but there are a lot of companies, such as 3Com, that can pick up the product-innovation slack.
Sales Of Non-Intel-Based PCs On The Rise	According to analyst firm Computer Intelligence, Intel's market share slipped from 84.3% down to 54.3% for the period August 1997 to August 1998.	AMD realized massive gains in sales of its K6-2 processor. It sold almost 4M K6-2s in the quarter ending September 27, 1998, almost 1M more than expected.	"AMD achieved record sales... on [the] rapid market acceptance of our K6-2 processor with 3DNow! technology," said AMD's W.J. Sanders III.	Only two of the top seven PCs have Intel chips. With AMD, Cyrix, and Apple moving up the charts, is the move to low-cost PCs a good thing?

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MP3 Format Under Attack

German company wants big bucks from musicians, coders

A German research house may accomplish what the record industry and media mogul David Geffen couldn't do: derail the burgeoning MP3 movement.

The Germany-based Fraunhofer Institute began notifying software developers in September that it intended to collect payment for any applications using its patented algorithms that form the core of the MPEG Layer 3 standard. The Institute is asking for $25 per encoder/decoder—a stifling sum considering the majority of encoders only cost between $19 to $30—and 1 cent per MP3-encoded song.

If you're not clued in to the "MPEG3" scene, it's the ability to compress audio to near-CD-quality in compact 3MB- or 4MB-sized morsels. Without compression, a five-minute song would occupy 50MB. With its frugal space requirements, MP3 is considered the perfect format for creating and trading Internet music.

The record industry routinely cites the number of pirate MP3 web sites carrying copyrighted songs, but industry observers say the real reason for its persecution of the format is the fear that a direct digital distribution method will make it obsolete.

While most MP3 advocates said they didn't see the Fraunhofer Institute's demands as a real threat, conspiracy theories of alliances between the record industry and the Institute have cropped up. Unfortunately, Institute officials wouldn't respond to our repeated requests for an interview.

Palo Alto–based attorney Mark Radcliffe, who specializes in Internet law, said that it isn't yet clear what the Institute is trying to achieve, especially since it may not be cost-effective to pursue litigation against thousands of people who allegedly violate its patent.

"It seems they would be better focused on people who have money, not people spread all over the world," Radcliffe said. But he didn't discount the theory that Fraunhofer is being pressured by the music industry.

"I think the question is, How broadly will they enforce this? Will they use it as a proxy for enforcement of piracy, or will they use it to generate money?" he mused.

"The MP3 movement is bigger than the Fraunhofer Institute. The Internet can't be forced to do anything it doesn't want to do."

—Michael Robertson, president of Z Co. and www.mp3.com

Michael Robertson, president of Z Company and the commercial site www.mp3.com, said he believes Fraunhofer's goals are to collect revenue, not kill the standard, but says the Institute is overstepping its right if it demands a cut from artists who distribute MP3s.

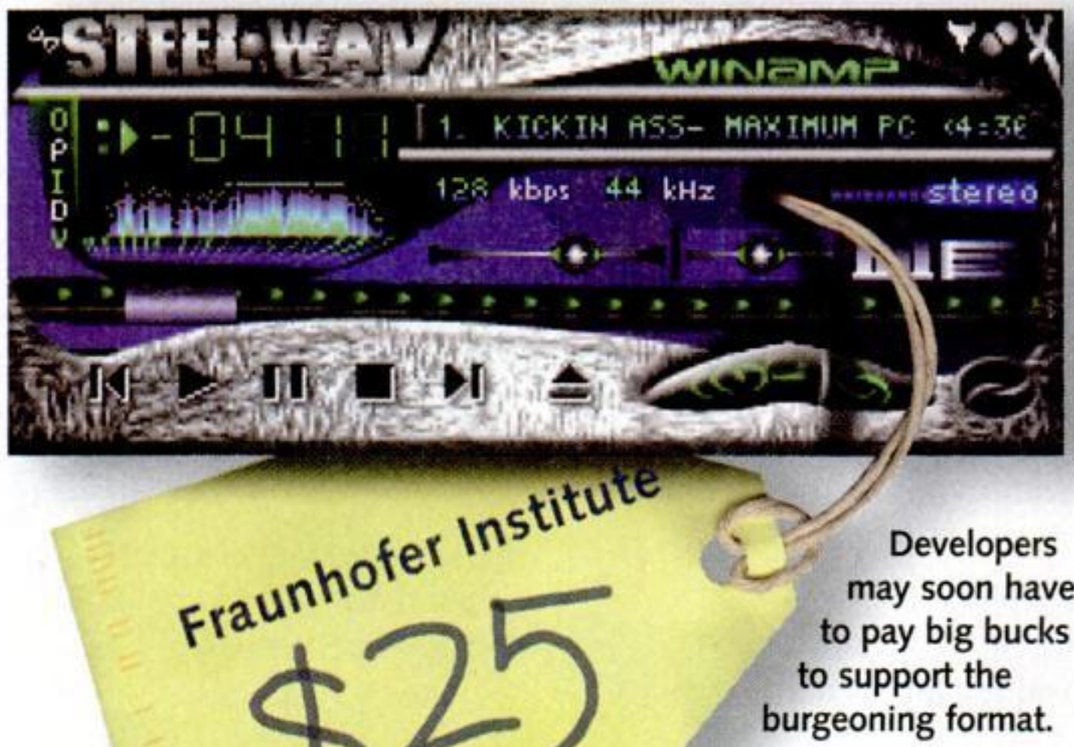
"It's like Adobe charging every graphic artist for a logo that's in PostScript format," Robertson said. "Or for that matter, Microsoft dinging you a nickel for every Word document."

Whatever the fallout, Robertson said he doesn't believe it'll change the groundswell of support behind MP3s.

"The MP3 movement is way bigger than the Fraunhofer Institute," he said. "The Internet is a very powerful medium, and it can't be forced to do anything it doesn't want to do." ✹

▶ This just in!

Just as we went to press, the Recording Industry Association of America (RIAA) filed an injunction to halt distribution of Diamond Multimedia's portable MP3 player, the Rio. Check out **www.maximumpc.com** for breaking details.



Developers may soon have to pay big bucks to support the burgeoning format.

SPIN CYCLE

HEADLINE	NEWS	DETAILS	QUOTE	OUR TAKE
Clinton Administration Extends Domain Registration Deal	Network Solutions was given a two-year extension to handle Internet domain-name registrations ending in .com, .net, .edu, or .org, through September 2000.	Network Solutions must also implement a shared registry system by June 1999 and transfer technical control to NewCo, an international non-profit corporation.	"We think this agreement will be viewed as a positive step for any individuals or companies with a vested interest in the Internet," said a Network Solutions spokesperson.	Setting up an independent body to oversee domain names is a good idea. We hope NewCo finds a way to deal with trademark disputes and international territories.
Direct Rambus Gains Another Supporter	AMD is hopping on the Direct Rambus high-bandwidth bandwagon, which will become the main memory interface for AMD's future logic chips, including the K7.	AMD says it has fully functional, full-speed 800MHz chips in operation. Intel will also adopt Direct Rambus for Merced, its upcoming server-oriented processor.	"Direct Rambus provides a high-performance, mainstream, low-risk solution that adds value across AMD's processor product line," said Atiq Raza, AMD's CTO.	Direct Rambus supports up to 1.6GB/sec of peak bandwidth from a single device. With both Intel and AMD onboard, its future seems bright indeed.

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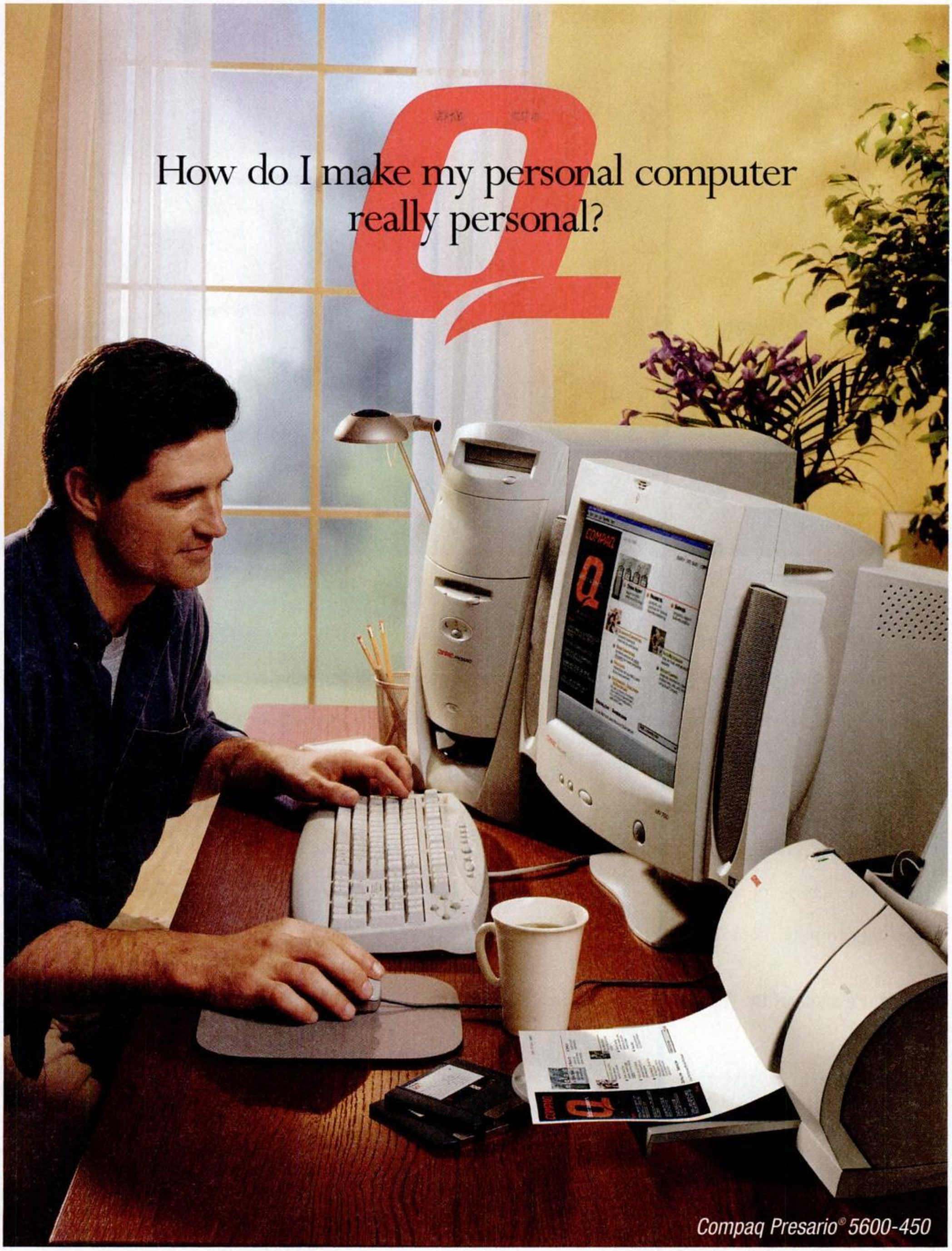

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[5]The 5X DVD-ROM Drive transfer rate is up to 6,750 KB/s compared to 1,352 KB/s for 1X DVD-ROM Drives. [6]2nd-Generation DVD-ROM Drives run at a higher maximum transfer rate of up to 2.76 MB/s compared to 1st Generation DVD-ROM Drives which run at a maximum transfer rate of up to 1.348 MB/s. [7]One year parts and labor. Labor for desktop systems is carry-in service with on-site service during the first 90 days of ownership. Labor for notebook systems is pick-up service. [8]U-ADSL updates may be downloaded from Compaq's Website when available. The 1.5 Mbps U-ADSL/56K v.90 modem protocol is designed to allow faster downloads from U-ADSL, K56flex, or v.90 compliant digital sources. Availability of U-ADSL services will vary by region and Internet Service Provider (ISP), and may differ from v.90 ISP services. Maximum achievable download transmission rates with U-ADSL and K56flex/v.90 are currently unknown, may not reach 1.5 Mbps or 56 Kbps respectively, and will vary based on service provider, line conditions, and distance. Compaq is not liable for pictorial or typographical errors in this advertisement. Compaq, the Compaq Logo, and Presario registered in U.S. Patent and Trademark Office. Microsoft, MS, and Windows are registered trademarks of Microsoft Corporation. Intel, the Intel Inside Logo, and Pentium are registered trademarks of Intel Corporation. Product and company names mentioned herein may be trademarks and/or registered trademarks of other companies. **Call Compaq Monday-Friday 7:00am-11:00pm (CST), Saturday and Sunday 7:00am-7:00pm (CST).** ©1998 Compaq Computer Corporation. All rights reserved.

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WATCHDOG

▶ Maximum PC takes a bite out of bad service and gear.

DEAR DOG I recently had a bad experience with **BZBOYZ AKA MicroX** (www.bzboyz.com).

I run a small in-home computer business and had ordered three Seagate Medalist 3.2GB hard drives, all three of which were bad. One appeared to have been dropped and had a connector that was bent. This drive was riddled with bad sectors, while the other two could not even be accessed for partitioning. I've tried getting an RMA, but they keep insisting they have to charge a 15% restock fee and send me to their web site's RMA request page. I've filled out the page three times, to no avail. The company denies there is a problem and will not take action to resolve it. My only recourse seems to be through my credit card company, which I'm working with to get the problem resolved.

—Mark L. Sorensen

THE DOG One of my first calls was to the local Better Business Bureau. The Bureau reported that it hadn't logged any complaints, but noted that BZBoyz hadn't even been noticed until September, when someone called to check on its status. The Dog's next trick was to call the company. Alarm bells went off when all three of BZBoyz's phone numbers were disconnected. The Dog also could not find a county or city business license or state tax license for BZBoyz. Had BZBoyz gone belly up?

No, according to a Sam Desai, who the Dog was able chase down through a computer store BZBoyz rents space from.

Desai, who said he is helping BZBoyz clean up its mess, laid out the problems BZBoyz has been having. Desai said the company started doing business on the web only recently and experienced an "explosion of web business." When BZBoyz burned through a month of credit in just 10 days of online business, the bank got nervous and put the brakes on.

According to Desai, the bank was withholding $60,000 to $70,000 of BZBoyz's sales as of September. The owner of the business, a Mr. Singh, had no choice but to shut down the phones and turn away customers, Desai said. Singh was unavailable for comment because he was overseas trying to raise capital to continue. Only a handful of people were still having problems with getting product owed to them or a refund, Desai said. And what about Sorensen's problems with getting dinged with a bad product?

"If the product was defective (a restocking fee) should not have been applied," Desai said. Upon checking records for BZBoyz, Desai claimed the company had already credited his account for the three hard drives. Desai told Sorensen he would fax copies of the credit receipts as proof. But weeks after the Dog spoke to Desai, Sorensen said he still hasn't settled the matter.

MARK SORENSEN I have received no new correspondence from any representative of BZBoyz/MicroX or whatever they are now calling themselves. I have not received a fax of the credit they claim to have made, and my credit card company is not showing a credit. I have filed a formal dispute and am allowing my credit card company to handle any further matters.

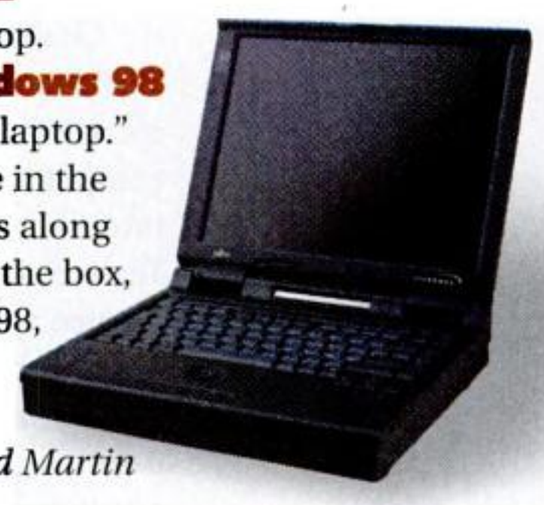
At press time, the Dog tried to contact Desai or Mr. Singh by phone, but was told neither was available. E-mails to Desai were also not returned. Until further word on the stability of BZBoyz, you can consider it in the Dog House.

WIN98 UPGRADE WOES ▶

DEAR DOG In June 1998, I bought a **Fujitsu LifeBook laptop** computer. It's a great laptop. When I bought it, I got a coupon saying "**Windows 98 upgrade** for $29.99 with the purchase of this laptop."

I sent a money order for the Win98 upgrade in the amount of $29.99 to Softbank Content Services along with the sales slip and the mark on the side of the box, as told on the slip. I mailed this on June 15, 1998, but have not heard from them yet. I have written to them twice with no answer.

—Alfred Martin



Fujitsu LifeBook

THE DOG spoke to Kathy Holman, a senior manager of channel sales at Fujitsu about Martin's delay. Holman apologized for the delay. Fujitsu and other PC makers have had to rely on third-party fulfillment houses to process Windows 98 per Microsoft's mandate, Holman said. Because of the huge demand, many of the fulfillment centers have been overwhelmed with shipping out upgrades. "To say they're backlogged and their infrastructure is stretched is an understatement," she said.

"To say they're backlogged and their infrastructure is stretched is an understatement."

Holman had a few suggestions in Martin's case, however. Although she believes it was Fujitsu and its fulfillment house that probably dropped the ball, Holman said people should check the status of their orders when they don't receive them within the proscribed time. "Fujitsu prides itself on quality service, products, and

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programs, we believe this kind of thing is unacceptable, frankly," Holman said.

After Martin ordered the upgrade, Fujitsu changed the offer to a free upgrade. Holman said she would have the upgrade expedited and someone would investigate what happened to Martin's money order. Martin received his upgraded version of Windows 98 and a Fujitsu carrying case, and wanted to thank Holman for her aid. But Martin did want to add one last comment:

ALFRED MARTIN "I don't want anything to do with mail-in rebates. I think it's the worst thing that ever came out. It's too much aggravation."

"I don't want anything to do with mail-in rebates. It's too much aggravation."

SHARK MAKER NOW CHUM ▶

DEAR DOG Earlier this year, I purchased the **Avatar Shark 250**. It has performed flawlessly, and I heartily recommend it to anyone needing extra storage capacity. However, I promptly mailed the $50 rebate coupon included in the package after buying it, but never got a check. What's worse, the Avatar web site (**www.goavatar .com**) is kaput. Can you help?

—Thomas K.

THE DOG Thomas, not even I can help you with Avatar. Avatar Peripherals/Systems, makers of the fantastic and tough Shark removable media drive, has found itself chum in a sea of technology companies. Avatar filed for Chapter 7 bankruptcy on August 7 in the Northern District of California U.S. Bankruptcy Court. It's not clear what speared Avatar, but one can guess heavy competition from Iomega and SyQuest didn't help. Internet rumors suggesting Simple Technology might pick up service and warranty on Avatar products have proved false. The deal was never consummated, and Simple says it has nothing to do with Avatar products.

Avatar Shark 250

There is one last long shot consumers can take. The Dog consulted San Diego attorney Michael Breslauer, who said consumers who believe they are owed money from Avatar can take the time and 32 cents to file a claims form with the court.

Claims should be mailed to the court at at 280 South First Street, 3rd floor, San Jose, CA, 95113. The case number for the bankruptcy of Avatar Systems, the larger of the two, is 98-56379-ASW. Keep in mind that the cut-off date is in December and claims filed after that should include a note that the petitioner has just learned of the bankruptcy.

DOG BITES ▶

THE DOG has heard differing reviews of JTS Corp.'s service complaints that landed it in the Dog House in the last issue. **ROBERT CLIFTON** wrote in with a counterpoint:

"...I had a very different experience with **JTS Corp**. In late January, I had a nephew bring me a system with a crashed JTS hard drive he bought used. I replaced it with another JTS, as it was the most inexpensive drive I could find. I called the company's toll-free number and talked to a very pleasant operator who gave me an RMA number. Later the same day, his supervisor called to see if I was satisfied with the help that I received. I sent the 1GB drive back to JTS and less than ten days later a new 3.2GB drive arrived. Two months later, the 1GB I bought as the replacement developed a bearing problem. I sent it in, and less than 10 days later a new 2.1GB was at my door. Needless to say, they have my support."

Although Clifton had excellent service, raves for JTS's service and support from readers were few and far between. More **of the messages were** like **BRUCE REINHART**'s:

JTS Hard Drive

"...I too have a big problem with JTS! I've had four drives take a dive on me, one after only one week of use. I've been waiting for the last unit to be returned for almost four months now. I have an RMA number and have called their so-called "Express" phone line so often I lost count. The good news is that after the first two drives died, I installed a Seagate as my main drive and used the JTS as a slave just for back ups, thinking that if I used it less it might last longer. Wrong—well, you know what happened to my back ups."

Since the Dog's last report on JTS, the company disconnected its toll-free express support number and BBS line, and removed references to the seven-day product turnaround from its web site. Calls to its RMA line were not returned.

JTS's bleeding, which **culminated with a $58.4 million** net loss last September, **apparently hasn't stopped either.** The company **sold off its ownership of Atari in** February to **Hasbro for $5 million. In May, the** American Stock **Exchange removed the company** from public **trading. And according to a recorded** message **at JTS's investor relation's department,** auditors haven't **been willing to sign off on its quarterly 10K report to the Securities and Exchange Commission, and the company had no idea when or if it would be publicly traded again. What's going on? The Dog doesn't know, but has to presume that JTS will remain in the Dog House until its financial situation clears up.**

Got a bone to pick with a vendor? Spiked by a fly-by-night operation? Sic the dog on them by writing: **watchdog@maximumpc.com**. The dog promises to get to as many as possible but only has four paws to work with.

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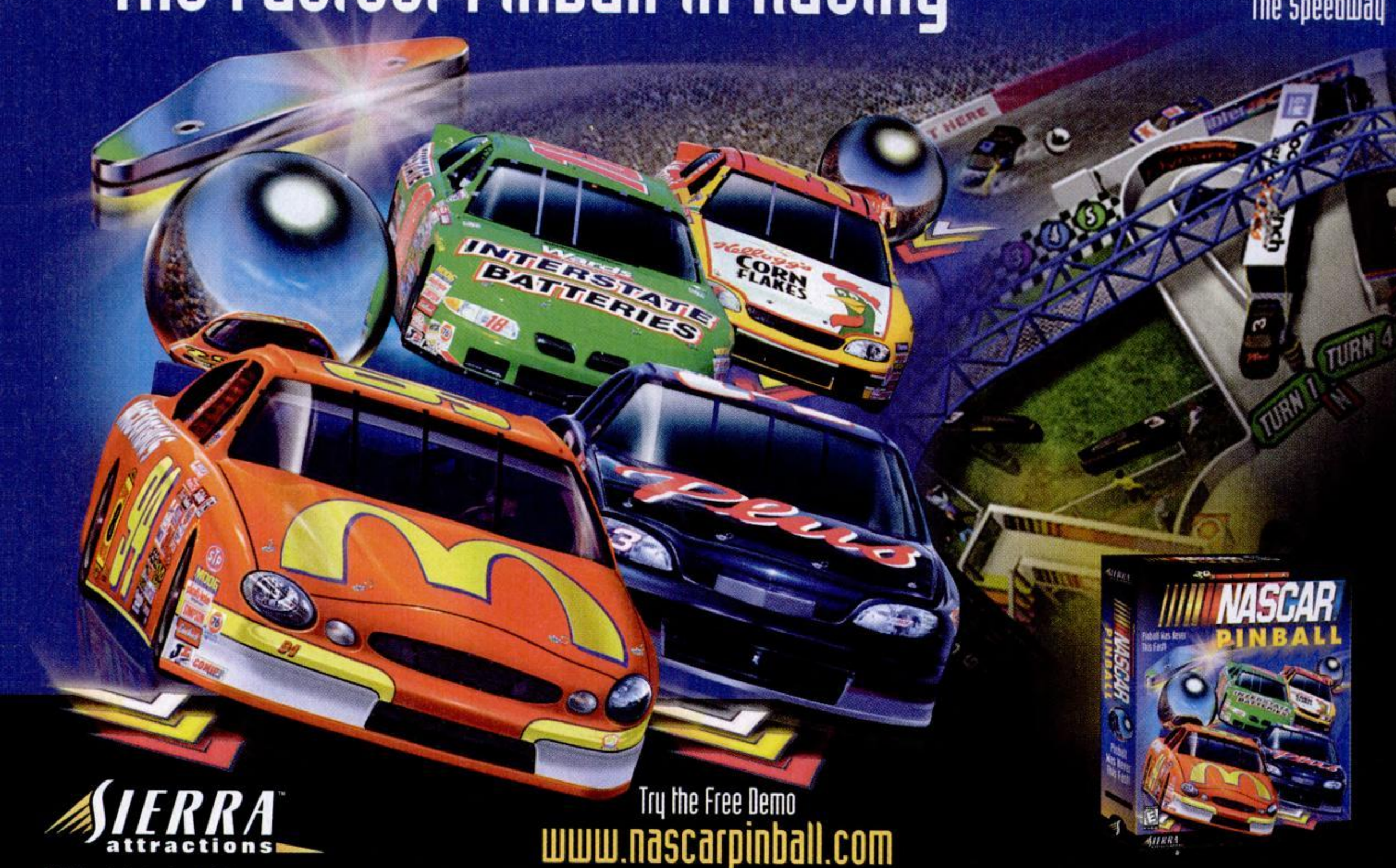

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Lego; www.legomindstorms.com; 800.453.4652

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RATING PENDING RP ESRB

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Readin', Ritin', and Renderin'

MMX, 3DNOW!, AND KATMAI... OH MY! OUR 3D PRIMER

Let me state at the outset that math was my worst subject in high school. Only the heroic efforts of a private tutor saved me from flunking Algebra II.

This is unfortunate because unlike many people, I actually need to use some higher math in real life. One day I struggled for hours to transform an equation that was critical to a Java program I was writing. I grew so frustrated that I almost approached some high school kids hanging out at a Taco Bell. I figured at least one of them could solve the problem. But at the last moment I turned away, fearful that soliciting a minor for algebra might get me into trouble.

My point is that if *I* can grasp how computers render 3D graphics on a screen, anybody can. And it's an important thing to grasp these days because of all the confusion around MMX, 3DNow!, and Intel's Katmai instructions.

You probably know that Katmai is Intel's code name for a new P6-series microprocessor coming out early next year. (The Pentium Pro, Pentium II, Celeron, and Xeon chips are all P6-series processors.) Katmai will introduce 70 new instructions for accelerating 3D graphics and other operations. The instructions are for programmers, and your 3D software won't run any faster until programmers start using the new instructions in their programs.

Sometimes the Katmai instructions are called "MMX2." The original MMX, introduced by Intel in 1996, added 57 new instructions to x86-compatible processors. But here's where some people get messed up. Contrary to popular belief, MMX did absolutely nothing to accelerate the most critical part of 3D graphics: geometry transformation.

Geometry transformation is the heart of 3D rendering. Every 3D object on the screen consists of building blocks known as polygons. Usually the polygons are triangles or rectangles. The smaller the polygons, the better, because the object looks more finely detailed. But the smaller the polygons, the more of them it takes to build a 3D object. A typical object in a PC game might have anywhere from a few hundred to a few thousand polygons.

Every time a 3D object moves on the screen—or whenever you change your view of the object—the computer has to redraw all those polygons. To do that, it has to calculate a new point on the screen for every corner (vertex) of every polygon. If an object consists of 1,000 polygons, and if the polygons are triangles, the computer has to recalculate 3,000 vertices to redraw the object.

MMX can't help. All MMX instructions are integer operations. That means they manipulate whole numbers (1, 2, 3, 4, etc.). Integers aren't precise enough for geometry transformations. Instead, the computer must use floating-point numbers—in other words, fractions, such as 4.95 or 98.6.

Computers aren't very good at floating-point math because they think in binary, a simple number system that has only two digits (0 and 1). To approximate a floating-point number, they string a long series of binaries together. The longer the series, the more accurate the approximation. For the purposes of drawing 3D objects on the screen of a PC, it takes 32 binary digits (bits) to make one floating-point number. This is known as 32-bit or single-precision floating point. (Double-precision floating point is 64 bits long, but that's overkill for 3D graphics on a PC.)

To recalculate every vertex of every polygon, the computer has to perform an operation called matrix multiplication. A matrix is a block of numbers, like a Bingo card. In matrix multiplication, the computer multiplies two matrices together and adds the results. For 3D graphics, this usually requires multiplying a 1x4 coordinate matrix (one row of four numbers) against a 4x4 transform matrix (four rows of four numbers). All told, that's 16 multiplies and 12 adds. So a 3D object that has 1,000 triangular polygons (3,000 vertices) requires 84,000 multiplies and adds each time it moves—and each of those 84,000 operations involves two single-precision floating-point numbers. Gak!

Now you can see why Intel's Katmai instructions (and the 3DNow! instructions supported by AMD, Cyrix, and Centaur) will kick butt. One instruction can perform two floating-point operations at once, where before it took two instructions. Even without any other improvements, Katmai and 3DNow! double a chip's ability to crunch 3D graphics.

Keep in mind that all we're talking about here is geometry transformation—redrawing the wire mesh of polygons that forms the skeleton of each 3D object. That's just the beginning. To finish rendering the object, the computer still has to apply textures and other effects. Regular MMX can help with that, and a good 3D graphics accelerator makes the biggest difference of all.

Compared to the calculations in a 3D action game, the math in a typical business spreadsheet is kindergarten stuff. The program that handles the weekly payroll at General Motors sweats less than *Unreal* does on your home PC. ✹

Compared to the calculations in a 3D action game, the math in a typical business spreadsheet is kindergarten stuff.

TOM HALFHILL was senior editor at Byte magazine and is regarded as one of the most knowledgeable experts on processor technology in the industry. Contact him at **thalfhill@maximumpc.com**.

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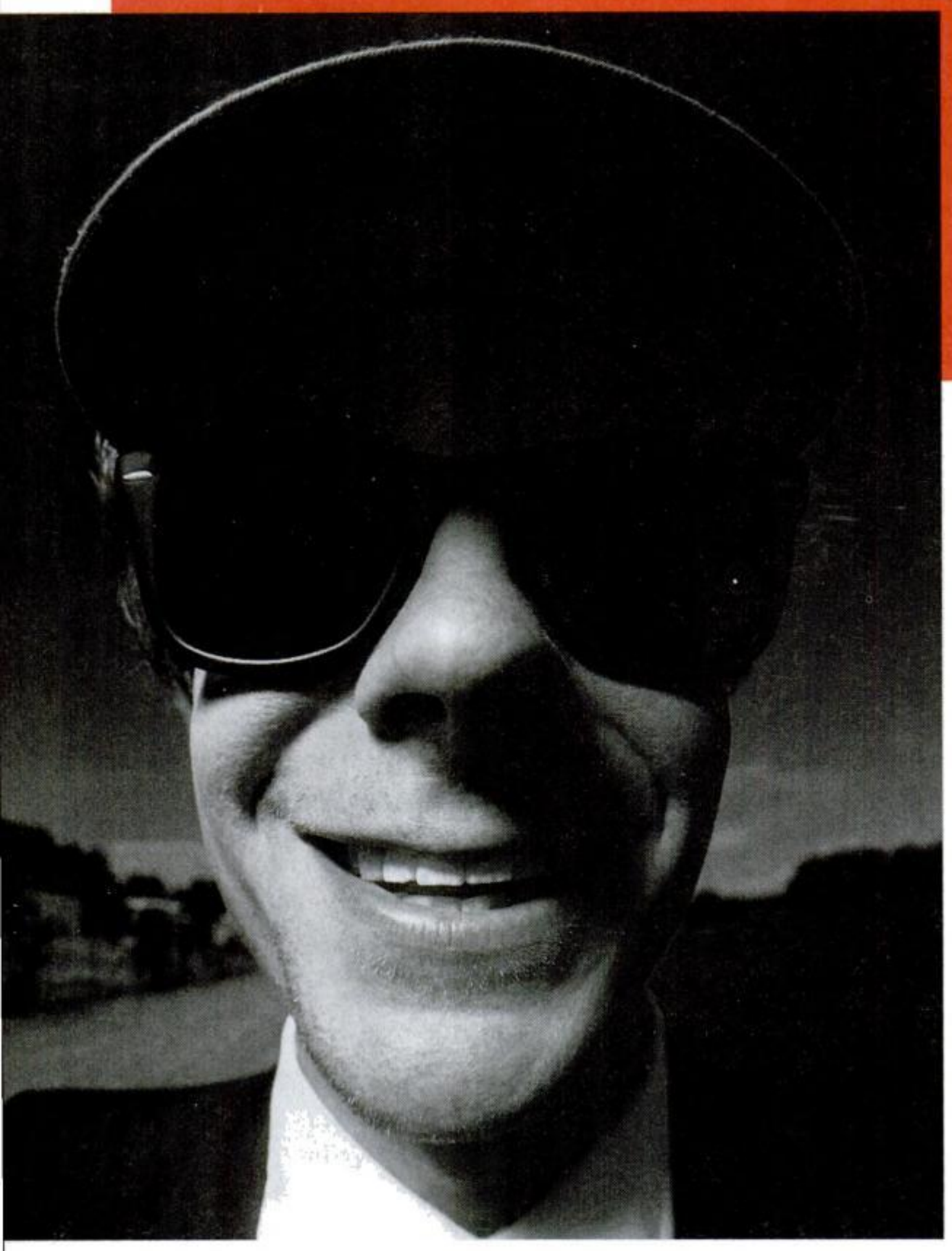

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ON THE LINE

As Netscape's share in the browser market drops below 50% (according to a September study from International Data Corp.), one has to question the success of its top marketing priority: Netcenter, an all-in-one directory, search service, and content center. Read: Portal.

Netscape is just one of many companies—along with Infoseek, Disney, Amazon.com, and soon Microsoft—using portals to build product loyalty and allegedly generate revenue from co-branding and e-commerce, with objective and entertaining content.

Besides the fact that marketing and objective are concepts that can't be used in the same sentence together honestly, it's also notable that these portals depend on bazillions of net users rallying together, celebrating the cult of product under the guise of "community."

Netcenter depends on users to supply its content, hoping to create some sort of personal investment in its offerings, and Amazon.com thinks that well-groomed chat sessions will inspire a sense of loyalty in purchasing books discussed with Amazonian "friends."

I talked with two companies, Electric Communities (which recently acquired The Palace), and Flatland, a San Francisco start up. The two have chosen distinct paths to define community and make a business: build the network and supply the content vs. build the tools and host the content. It should be noted that these channels are not mutually exclusive.

How To Succeed Online

WITHOUT REALLY CREATING ORIGINAL CONTENT

Building the network and supplying the content... Chip Morningstar and Randy Farmer, co-founders of Electric Communities, designed and built the world's first large-scale multiperson online graphic environment for LucasFilms—Habitat—in 1984 and have been building business around communities ever since. "Community on the web today is situations where the community already exists in some other context, and the web is being used as a communications tool to help hold that community together," says Morningstar.

"Electric Communities' business is developing secure, distributed systems for social and economic interaction among communities of people over the net," says Morningstar. "In the interest of getting into play in the marketplace soon, we acquired The Palace as a complete product that would let us follow a more rapidly paced and more incremental approach."

When asked whether the web could sustain a business model around "community," Mark Jeffrey, co-founder of The Palace Inc., exclaims, "Sure! In the movie business, you call the people using your product 'the audience.' The only difference between a community and an audience is that information is moving in a many-to-many fashion instead of a one-to-many fashion. Traditional media has dominated for the last few decades with this one-to-many blast model, but what's happening now is the connection of all the "many" out there with one another. You can either charge admission, advertise to them, or sell them things once you have them. All three are businesses."

SHEL KIMEN
has worked in the industry, traveled the world, and covered the Internet for both The Net and boot magazine. She can be contacted at **skimen@maximumpc.com**.

Building the tools and hosting the content... Michael Powers, founder of Flatland, offers a different perspective. "Business and community are strange bedfellows. Business tends to injure community if too aligned with the communal life, such as planned communities or the railroad-worker towns run by the railroads in 19th century. Without business, a dwelling community can lose its foundation, its place to be. The net can support certain types of communities and some types of business around them, but is always in danger of creating the company town," said Powers.

So instead of cultivating an audience, Powers wants to cultivate producers.

Flatland invented a technology, 3DML, "to make the creation and publishing of 3D spaces on the web as easy as creating HTML pages and to create a hosting site where a community of 3DML builders will publish, compare notes, and connect around their common interests. The community is about personal publishing, not about living in 3D cyberspace," according to Powers.

If you're going to build, it's a good idea to know what you're building with. 3DML is Flatland's own 3D game engine running in 16-bit color using OpenGL. You'll get 12fps on a Pentium 166 or 20 to 25fps on a Pentium II 233. It supports GIF, GIF animation, and JPEG graphics formats as textures, WAV files, and dynamic lighting. Go to **www.flatland.com** to download a 30K application (35 seconds on a 28.8 modem) and sets of building blocks—models, textures, sounds (300K each, which is another 75 seconds).

Portal sites? Jeffrey added, "Portals are the metropolises of online communities—they are where the greatest online masses are moving through at any given moment. Therefore, communities tend to arise spontaneously from them through the sheer volume of 'random collisions' of like minds." ✹

These portals depend on bazillions of net users rallying together, celebrating the cult of product under the guise of "community."

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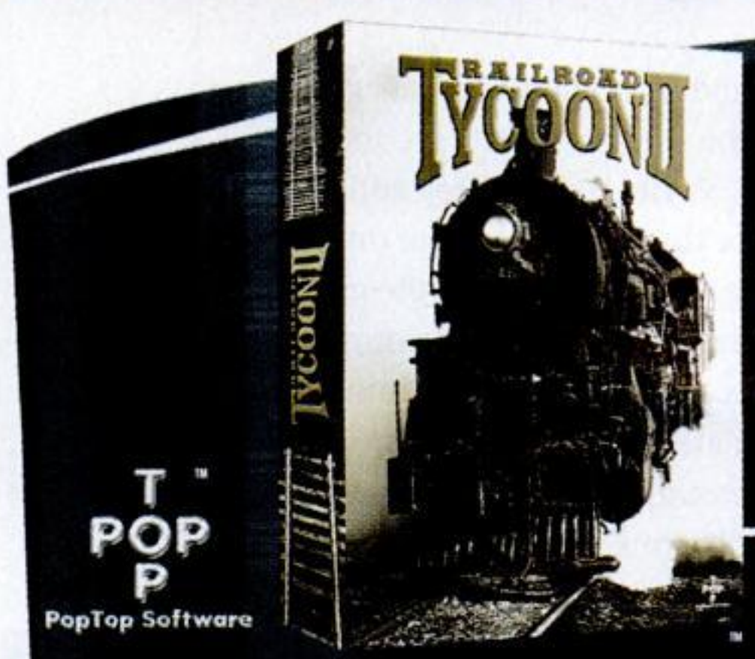

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GAME THEORY

T. LIAM MCDONALD
is a veteran of PC Gamer magazine and is much bigger than he looks in this picture, so keep that in mind before writing him any hate mail at **tmcdonald@maximumpc.com.**

There's one question on the lips of gamers: So, have you played *Half-Life*? Even among the cynical, jaded sots who do this for a living, people are impressed. Some are even timidly summoning the specter of *System Shock* to elucidate its many sublime qualities.

System Shock was the crowning work of Looking Glass, which has not produced a similarly compelling game since. (No one else has either, so there's no shame.) The game grew out of its ground-breaking work on the *Ultima Underworld* games, and the three taken together form a high-water mark for third-person gaming that has still not been matched. Their success can be boiled down to a single concept: total immersion in an utterly believable, yet obviously fantastic, world.

It was not wholly a matter of narrative or character. *System Shock* had both in degrees, but the narrative was unsophisticated and the characters hardly three-dimensional in a novelistic sense. It was enough to create a sense of purpose and drive (something most action games sorely lack), but the narrative delivery medium was limited to e-mail messages. These connected you to the world and kept you moving forward.

Beyond this, *System Shock*'s true appeal was its amalgam of a great deal of mobility within the world, a rich (and scalable) combination of logic challenges and action, and an engine that created the illusion of a world adhering to the basic rules of physics. You could do more than run and jump in *System Shock*: you could crouch down and lean to the right, or turn your head—relatively new concepts for the time. The game world itself had the design and feel of a real place in time and space. It was vivid. It was alive.

Half-Life lacks the gaming complexity of *System Shock*, but exceeds it in narrative drive and, of course, visual detail. From the first moments, you are plunged into a world that is utterly gripping. It is cinematic, in a good way, with actions and reactions occurring constantly. The first five to ten minutes of the game is a fascinating journey into the heart of a test facility via tram. You can do nothing but walk around the tram during this sequence, but the lack of interaction is meaningless.

Once at the test facility, you can walk around, encountering characters who address you by name, lead you forward, and give you a sense of purpose. It's all fluid. There are no "levels," just brief load pauses. Scientists walk by muttering to themselves, shouting greetings, and giving you hints that everything is not all peachy. There's much more, but it should really be experienced rather than described. It's enough to say that following your role in an experiment gone wrong, all hell breaks loose at the facility, and you must fight your way out. The story and the NPCs don't vanish. In fact, they become more elaborate as the action heats up. That's hard to do. Keeping the excitement level at a high pitch while telling a story and creating the incidentals of the game world means having a lot of balls in the air at once, and *Half-Life* manages to juggle them all.

Half-Life contains few of the logic challenges of *System Shock*, and the art direction of the section I played lacked its sense of visual style. But in complete immersion and the game's absolutely compelling flow of action and story, *Half-Life* sets new standards. We haven't seen these qualities lately. *Unreal* didn't have them. Neither did *Hexen II*. *Quake II* certainly didn't have them.

Though technology continues to occupy most minds as the Holy Grail of development, sophisticated gameplay is coming back. Part of it is linked to the points I made last issue: that out-of-the-box game engines are making it easier for developers to spend their time on gameplay, rather than technology development. But that's not the whole answer. A generation of designers is at work now that has looked at what has come before, has lived through the doldrums of endless, empty games, and has decided they want something more.

This much is clear not just from *Half-Life*, but also from several other projects currently in the works. *Thief: The Dark Project* (Looking Glass) and *Deus Ex* (Ion Storm) both herald a return of gameplay style that has essentially lain fallow since *System Shock*. Since the people involved with them are, respectively, Doug Church and Warren Spector, two of the central talents involved in *System Shock*, this should be no surprise. Meanwhile, another Looking Glass refugee, Seamus Blackley, is putting the finishing touches on another complex first-person game: *Trespasser*. And then there is the just-announced *System Shock II*, which will be done using the *Dark Project* engine.

It's clear from all these developments that the days of repetitive shooters, with little to offer except their lighting models, is yielding to richer, more environmentally complex games. If *Half-Life* is any sign of a trend, content may once again be king. ✹

The Return of Content

HALF-LIFE HERALDS THE RETURN OF A BYGONE DAY

In the game's absolutely compelling flow of action and story, Half-Life sets new standards. Unreal didn't have it. Neither did Hexen II. Quake II certainly didn't have it.

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THE LAWS OF NATURE AND SOMEONE IS

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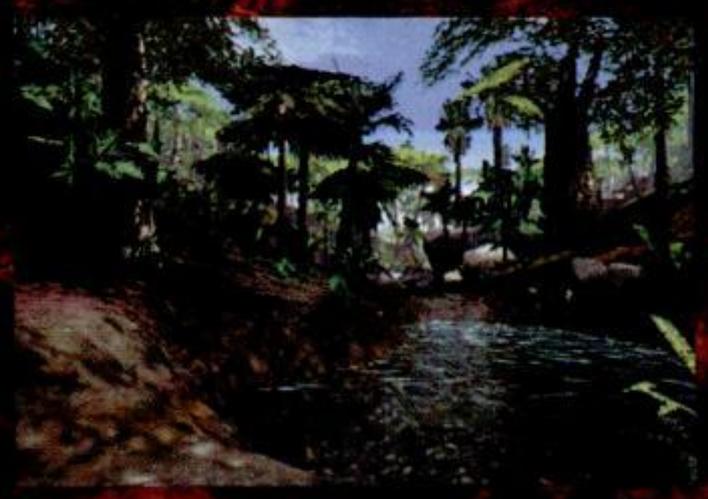

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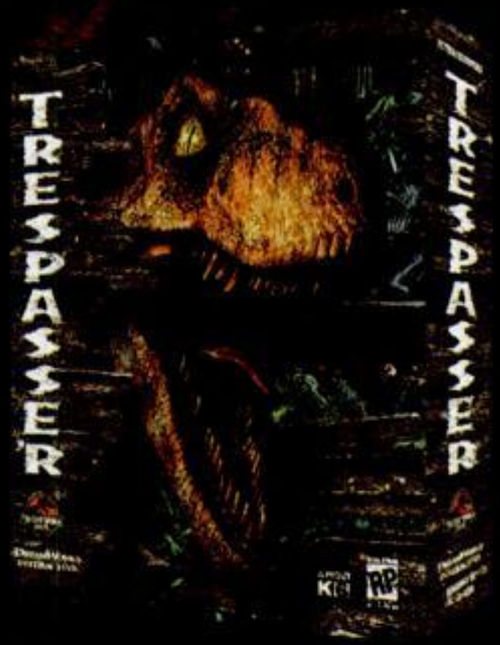

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CYRIX'S KEVIN MCDONOUGH TALKS ABOUT HIS NEXT-GENERATION OF CPUS, PRICE VERSUS PERFORMANCE, AND INTEL'S CHANCES OF SURVIVAL.

Deep IN THE Heart OF Cyrix

Maximum PC How has the Cyrix name lost so much stature?
McDonough The biggest perception probably comes from the fact that we aren't on the leading edge of introducing the fastest 400MHz or 500MHz processors. We do have a whole pipeline of architectures in development, such as the Cayenne core and the MXi, and we're about to unveil the Jalapeno, which will have an 800MHz-class core. But our intention will still be to supply the value segment, rather than the very high-end.

Games such as *Quake* play great on our M II product, but the floating-point unit isn't fully pipelined, and when you benchmark it against a fully pipelined Pentium II, it provides ammunition to Intel's marketing machine.

Maximum PC That's what we don't understand. Cyrix used to be the leader in floating-point performance. What happened?
McDonough We didn't see the impact of 3D coming. In hindsight, that was a bad thing. *Duke Nukem 3D* and *Doom* were pseudo-3D, and they performed lightning-fast on the M II. It wasn't until the Pentium P55-C brought out a hefty floating-point unit that the game guys got into floating-point 3D. We didn't have that architecture built into the M II at the time. We have rectified that, and with the Cayenne core we'll be bringing out a high-performance floating-point unit that will match the integer unit that's always been built into the M II architecture.

Maximum PC Why can't a fractional company such as Cyrix build a low-volume, high-performance CPU, but at a higher price? Like the Ferrari of the PC world?
McDonough That's the server market. I personally don't see that in the mainstream, though. In the consumer industry, price value is the major determiner of success.

Maximum PC So which does Cyrix think is more important to consumers—price or performance?
McDonough Definitely price. Consumers generally have a performance vector in mind, and then pick the best value in that range.

PROFILE

And he would be...?

Kevin McDonough is Cyrix's senior vice president and co-general manager. He's responsible for processor directives and integration initiatives, including the new Cayenne core and 800MHz+ Jalapeno processors.

And I would know him from...?

For some, Cyrix is synonymous with intense floating-point and math co-processors. For others, the name conjures images of low-cost processors with lousy performance. But with new super-pipelined processors coming down the pike, Cyrix is re-emerging.

And I would care because...?

If you root for the underdog, you may like Cyrix, which may turn out to be the proverbial dark horse in the CPU race. McDonough says he's targeting only the sub-$1,000 markets because he truly believes he can offer performance at that lower cost. The question is, do you believe he can pull it off?

PHOTOGRAPHY BY TIM ARCHIBALD

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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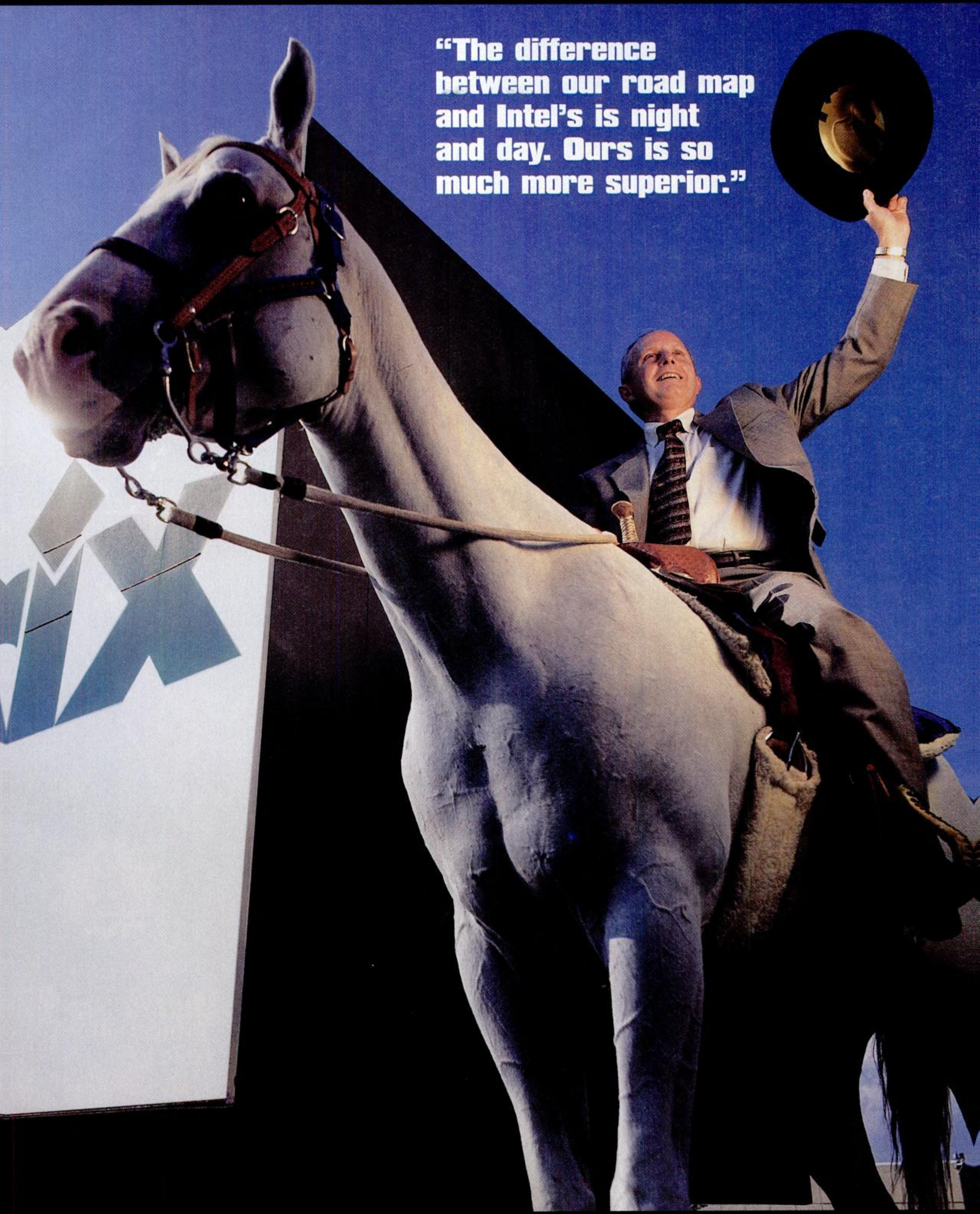

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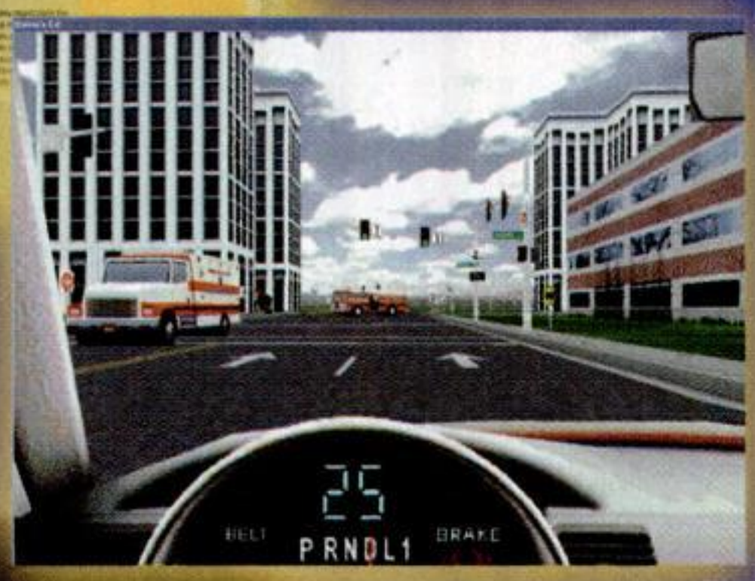

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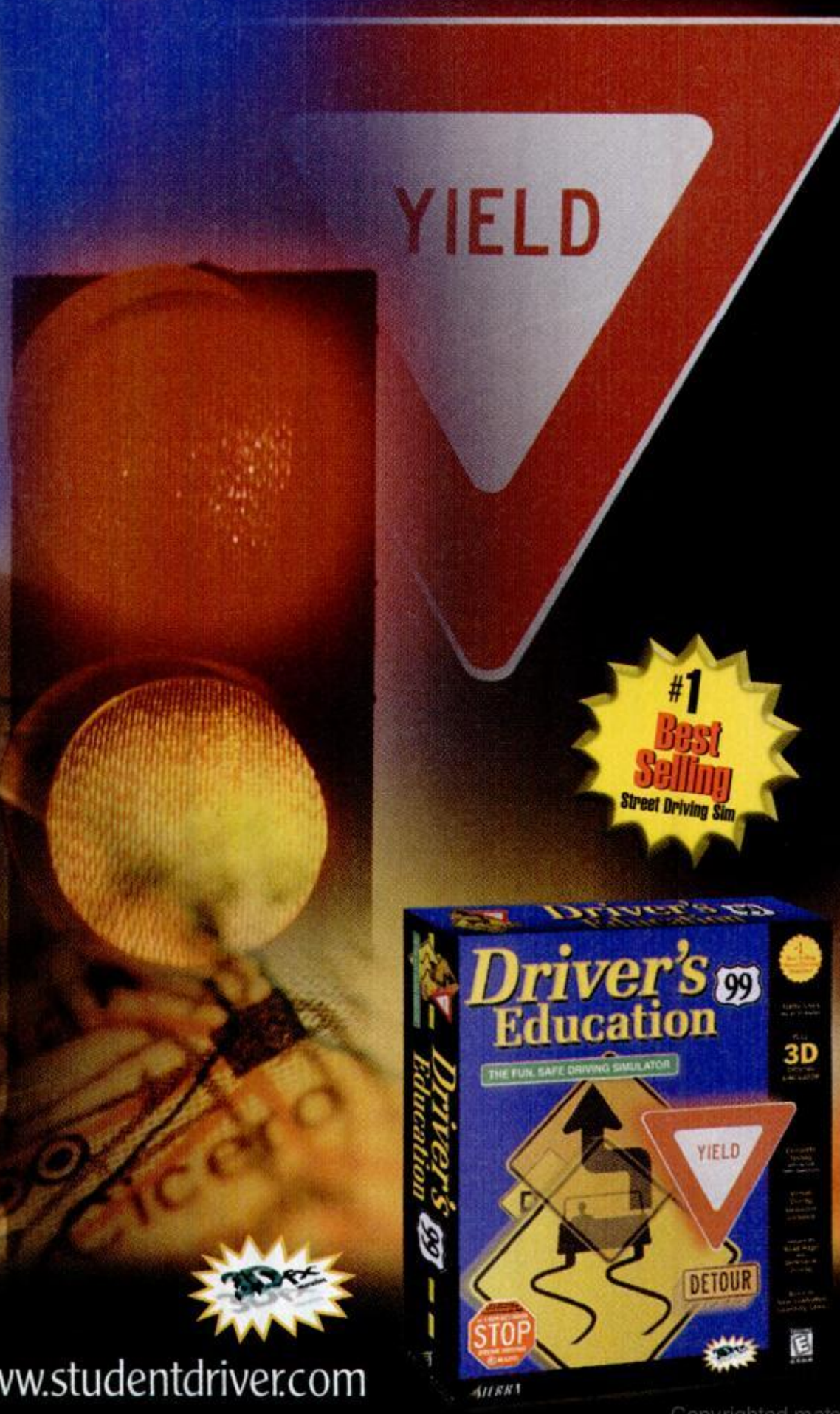

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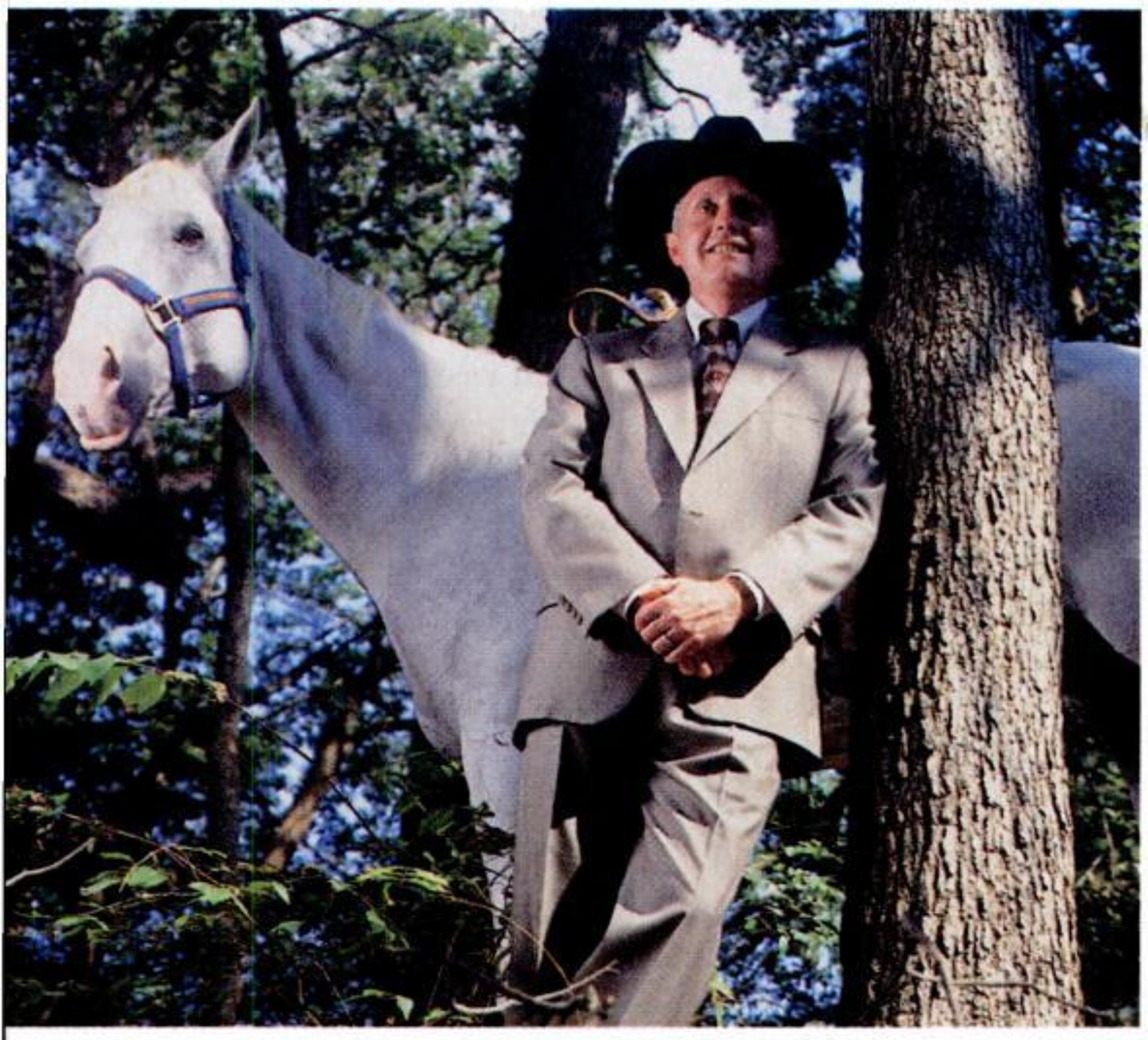

Intel felt there was no market below $1,000 and assumed consumers would not make that trade-off. Cyrix was instrumental in changing the whole perception of the marketplace. Our integrated processors launched the sub-$1,000 market and continue to do so.

Maximum PC But now that Intel is going after the sub-$1,000 space, where does that leave Cyrix?

McDonough It legitimizes what we've done and gives us an ideal marketplace to continue to innovate. Intel's approach is traditional: "Let me take existing silicon and move it down, give it a new product name." The first Celerons were very low-performance processors and got a bad name in the industry. Since then, Intel has introduced the Mendocino, which adds more performance back into the Celeron line. But how does it keep its Pentium II line fresh when a Mendocino is 95% to 98% of the performance of a Pentium II? Intel has to worry about persuading its customers to pay $250 to $500 for one processor while selling another one that performs at almost the same level for $100. We don't.

Maximum PC Your chips are sold under a "Performance Rating" instead of actual chip speed. How has this been received?

McDonough Actually quite well. I buy tons of workstations for my engineering group, and I never buy them based on a MHz rating. I buy them based on benchmarks for the software I'm running. Other than the games and floating-point issues we've discussed, our Performance Rating (PR) is what the user is *really* trying to measure.

Maximum PC Is there a formula for the PR?

McDonough It's basically based on benchmarks against the popular processors at that point in time. We use the industry-standard benchmarks, such as Winstone.

Maximum PC So you don't run any stand-alone applications?

McDonough Not to determine the PR. We do run quite a few stand-alone benchmarks, but we don't refer to them externally.

Maximum PC Was the PR system originally developed by Cyrix?

McDonough The PR was actually developed commonly between AMD, IBM, and us back in 1996. AMD used it on the K5, but abandoned it on the K6, maybe because their performance didn't stack up comparably when measured in MHz. From Intel's perspective, when you increase the processor by 50MHz and you only get a 3% performance increase, you obviously aren't going to want to talk about a Performance Rating.

Maximum PC Are consumers being needlessly bombarded with numbers, letters, and hype?

McDonough That's definitely the case. One interesting example is the overall acceptance of the iMac. It's only 233MHz in a $1,299 box, but what's most important isn't the speed of the processor, it's the ease of use.

I'd love to see an iPC built around some of the Cyrix chips. It would ship preconfigured, you wouldn't have to worry about IRQs, and you could just plug it in and it works. A lot of the new marketplace is looking for ease of use like that rather than: "Hey, I want to be able to swap up my graphics." Most people, at the prices we're talking about, can swap out their whole PC. An iPC built around our new MXi would run Windows, play fantastic 3D games, and have DVD hardware built into it. You could have all that for $999 including monitor. Talk about a dramatic product!

Maximum PC What about the complaints lobbed against the iMac for lack of expansion, lack of removable media, and lack of DVD?

McDonough That's the art of product definition—which of those are really needed? I believe the future of our integrated processors lies with 1394 and USB. Expandability will still be there and needs to be there, but it might be at a different level, without the difficulty of opening up the box.

Maximum PC Let's talk about your "PC on a chip" initiative scheduled for mid-1999. What is it?

McDonough I see it as a natural extension of what we've started with the MediaGX. Our first incarnation will utilize the MediaGX core, so it will have on-chip graphics, on-chip memory control, on-chip I/O control, and DVD support. The first one is clearly aimed at a consumer value segment—information appliances (IAs) and things like set-top boxes for web browsing, or playing x86 games, or running Windows or CE. These all will have very aggressive costs, space, and power targets. These are the kinds of targets that can make the difference in introducing new concepts to the market.

"We didn't see the impact of 3D coming. In hindsight, that was a bad thing."

Our view is there's no such thing as *one* PC-on-a-chip. What we're really developing is the methodology and the infrastructure to crank out one or more new PC-on-a-chips every six months once we staff-up more design teams focused on it.

Maximum PC We've already seen the microwave/PC hybrid and the fridge with an Internet-ready display. Is this the type of stuff you're talking about?

McDonough That's the type of stuff. And it will all be networked into a home server with an Internet satellite connection. Basically you share the Internet connection among all these terminals using some server, which is just a high-end PC.

Back in the early 1900s, people used to carry their electric motor around and put it into different appliances. Because an electric motor was such an expensive item at

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the time, you had one motor that powered a bunch of different appliances. That's the way the PC is used today. Most houses still only have one PC, and the family has to timeshare it, from browsing the Internet, to seeing what's on TV, to typing a term paper. Clearly these can be $199 devices and still be Windows-based, but they don't have their own hard disk storage because that's all located at the server in the network. So they're now your distributed electric motors that you find in your appliances today.

The PC will disappear behind the terminal itself.

Maximum PC And what price do you see the terminals coming in at?

McDonough Screen size and features could drive various price/performance elements, but they'll start below $399.

Maximum PC On the other end of the spectrum are your MXi and Jalapeno chips. Are they still on schedule?

McDonough Yes. The MXi with the Cayenne core is going to generate a number of products including additional integrated processors and even stand-alone processors. The MXi is already debugged in prototype, and we've got chips we're using in the labs. It's scheduled to go to production at the end of the first quarter. Sampling will occur sometime before that.

Maximum PC What speeds are we going to see?

McDonough We haven't announced that yet. But it will be very competitive from the MHz point of view.

Maximum PC So what exactly is the Cayenne core?

McDonough The Cayenne core is our next-generation part. We built it off the M II and have increased the MHz, and substantially re-pipelined the floating-point and MMX units. We've also added 3DNow!, which was an instruction set jointly developed by AMD, IDT, and us. MXi adds a full 3D graphics accelerator on-chip, including both the set-up engines as well as a high-performance graphics-pipeline engine. It also includes hardware support for DVD and motion compensation.

Maximum PC What level of performance can we expect from the integrated video?

McDonough It's a high-performance video engine, so it's clearly going to benchmark at the top of the range when it comes out. It may not be *the* highest performance video, but it will be close.

Maximum PC When you say "top of the range," what do you mean?

McDonough It will be in the single Voodoo^2 range.

Maximum PC That's a pretty lofty claim. Are you confident the performance is that good?

McDonough We obviously still have some work to do yet, but the hardware is there. I myself have played 3D games on the MXi, and the debug is coming along quite well. The final performance will depend a lot on final configurations—BIOS, MHz, memory bandwidth, what type of memory—that sort of thing.

Maximum PC And what can you tell us about your Jalapeno part?

McDonough Jalapeno is our generation beyond Cayenne and is clearly another order of magnitude. Our target is in the 800MHz range, and it's got very deep pipelines of course, but it also has very high-efficiency branch caching and branch prediction. It has large, multilevel, integrated on-chip caches. It also has five execution units, in terms that it can operate off, in parallel, floating points and MMXs and integer units and branch units. So it will offer a lot of parallelism, but it has been optimized for "Let's get the most bang for the buck" rather than "Let's make an eight-way machine where six of the ways sit idle most of the time."

It's a very good cost-effective architecture for high performance. So people that surmise GHz processors will only exist in $4,000 boxes aren't correct.

Maximum PC So you're saying consumers will be able to buy a GHz-powered PC for under $1,000?

McDonough Yes. We'll probably have samples toward the end of 1999.

Maximum PC So where does that leave Intel?

McDonough Intel is a good company. I'm sure they'll find marketing solutions that survive, such as the server business. Look at where Intel is putting its R&D: Merced, for example. It says a lot about how they feel about the sub-$1,000 markets. Their key technologists and the people driving the company are relegated to the high-end and server products first. That's the difference in philosophy that I hope creates niches for us both.

We're not in the business of killing Intel; we're in the business of creating a market that is a niche that we own and supply well. In the commercial space, the difference between our Windows-based-terminal road map and Intel's standard Pentium II road map is night and day. Ours is so much more superior. That's the kind of advantage that we would like to drive. ✹

"Intel is a good company. I'm sure they'll find marketing solutions that survive, such as the server business."

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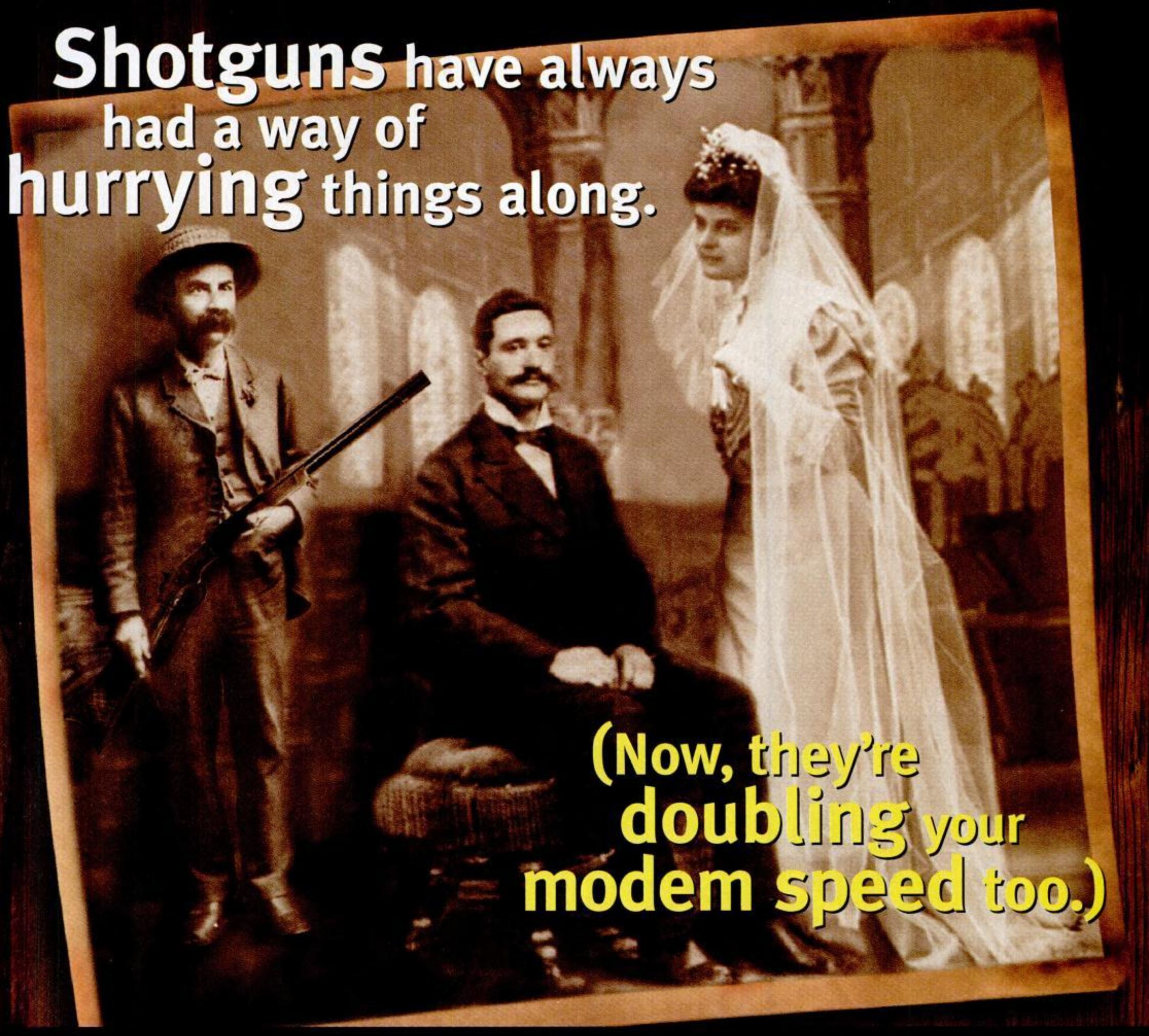

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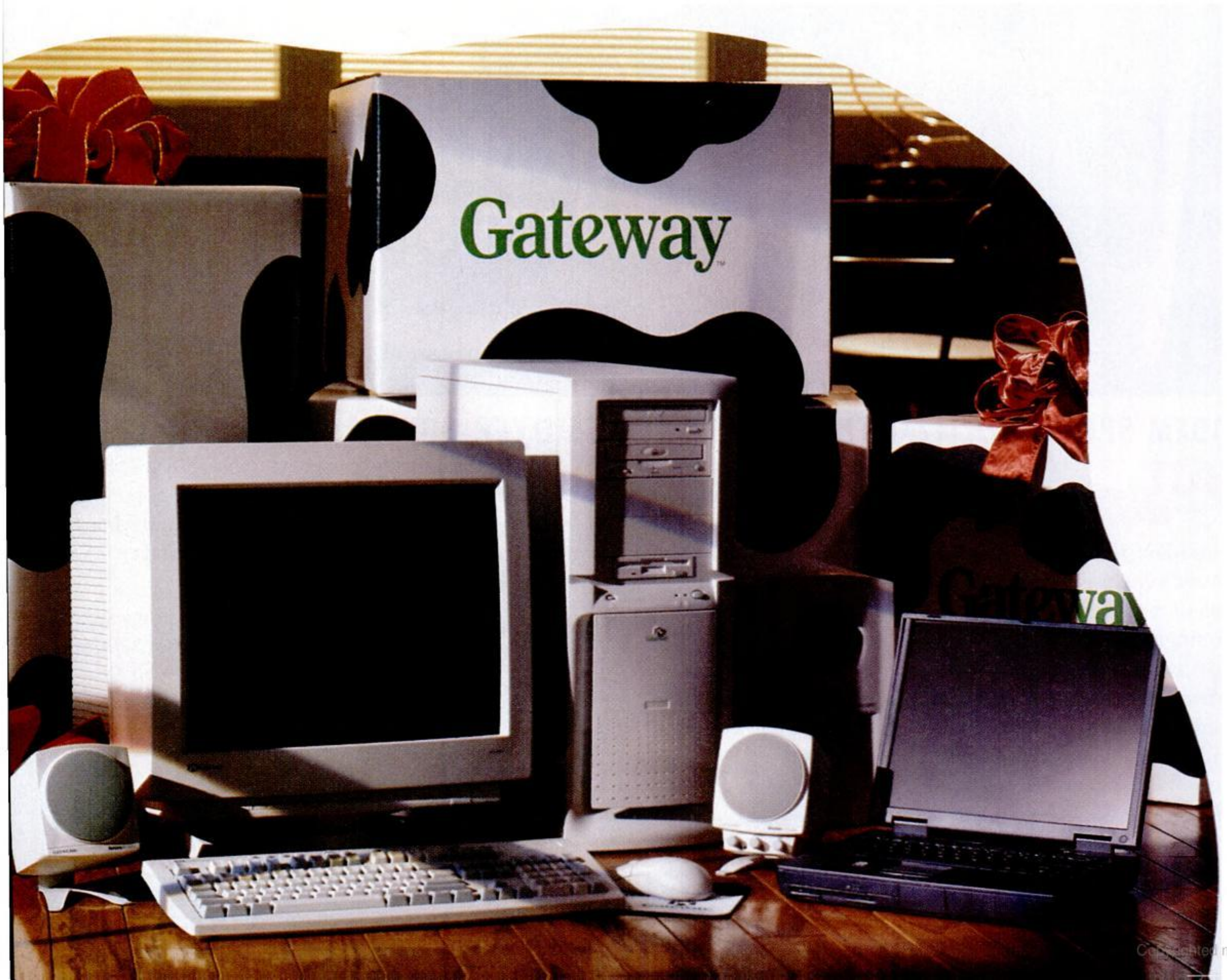

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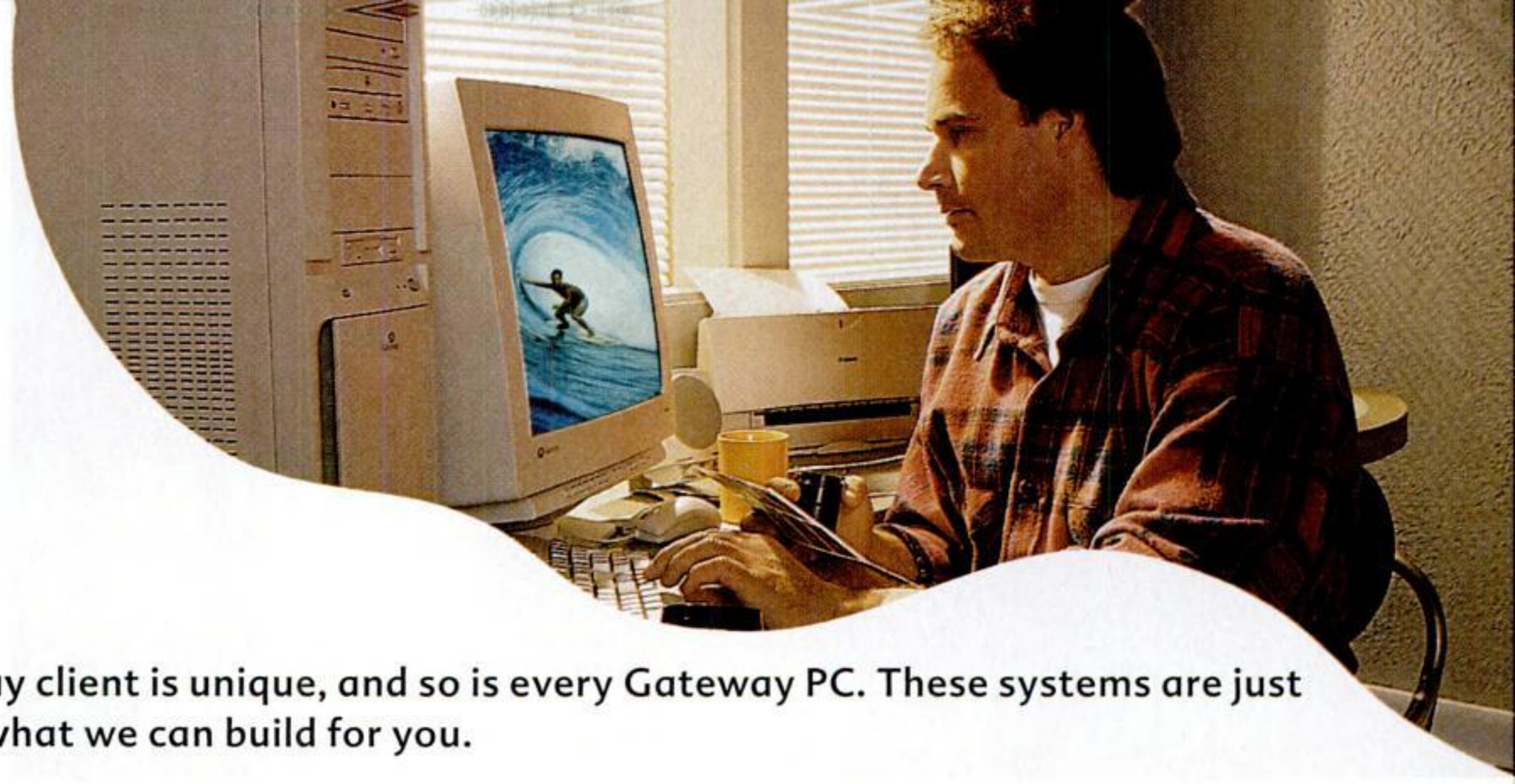

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WE'VE SEEN THE BEST

and we've see the worst. Trust us, the best is better. So, once a year, we gather all our intensive research and pull together the ultimate list of the stone-cold best hardware and software that survived the rigors of our lab testing. Editor by editor, we looked at every product, and whenever the tough decisions between contenders led to fist fights among the staff, we named a runner-up.

When the blood had dried, we pulled it all together. And now we proudly give you 1998's...

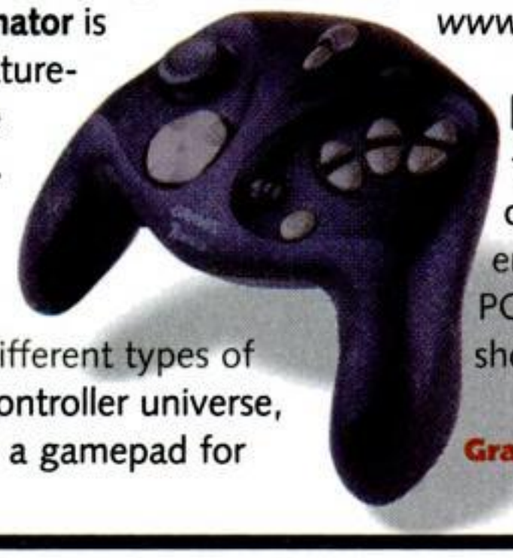
gear

of the year

BRYAN DEL RIZZO

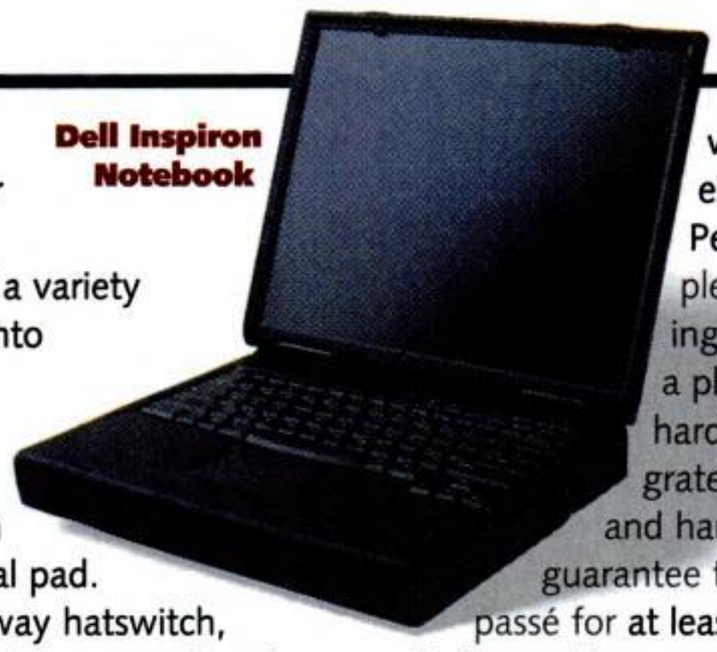
Our ever-prickly **news editor** *oversees our Inside Sources news department, cross-examines all Interrogation victims, and reviews game controllers and mobile computing gear. Don't even ask him about peameal bacon.*

► Best Game Controller It may not possess original ergonomics, but the Gravis **Xterminator** is the most versatile, feature-laden controller we've ever laid our paws on. And it's also darn comfortable for extended periods of time. Among all the different types of devices in the game controller universe, we decided to choose a gamepad for versatility's sake, and the Xterminator does indeed blend the best features of a variety of controller types into one package. For starters, you get a continuous-motion mini-joystick *and* an eight-way directional pad. Now add an eight-way hatswitch, two digital triggers, two proportional flippers, six primary fire buttons, and a proportional sliding throttle (great for flight and driving games). If that weren't enough, there's also a special button to trigger preset game cheats. Practically the entire thing is programmable, and you can assign game functions and commands at a drop of the mouse. Receives a perfect 10/Kick Ass on page 72. *$50, www.gravis.com*



Gravis Xterminator

► Best Notebook It comes down to this: The Dell **Inspiron** is the only notebook that's powerful enough to replace your desktop PC. Its 300MHz mobile Pentium II should satisfy all computing urges, ranging from mundane word processing to exhilarating 3D gaming. Perhaps even better, a plethora of ports (including USB and S-Video-out), a pleasantly plump 8GB hard drive, and an integrated DVD-ROM drive and hardware decoder card guarantee the notebook won't be passé for at least a few years. Finally, kick-ass video care of an 8MB ATI Rage LT Pro and 15-inch display scream to the world, "I'm primed, I'm pumped, and I want to play!" The Inspiron epitomizes power—and that's why it got a perfect 10/Kick Ass in October. *$3,700, www.dell.com*



Dell Inspiron Notebook

Runner-Up Built around a 266MHz MMX Pentium processor, the Sony **VAIO 505GX** doesn't score points for performance, but it does get special recognition for its featherweight, one-inch thick, three-pound design. And with a tough-ass magnesium alloy case that measures only 10x8-inches, it's small enough to tote anywhere. It got a 9 verdict and a Kick Ass award in October, and showed all the *Maximum PC* boys that portability will be de rigueur in 1999. *$2,700, www.ita.sel.sony.com*

SARAH PIRCH

Our **managing editor** *is responsible for checking every single word in the magazine, keeping it on schedule, and reviewing pointing devices, printers, and speech-recognition software. Other than being a frustrated singer, she has no skeletons in her closet.*

► Best Mouse We've raved about the Logitech **Mouse Man+** in the past for good reason: Its ergonomic design fits comfortably in the beefy hands of Editor-in-chief Brad Dosland, as well as in my exponentially smaller hands. Four buttons, including a thumb button and a rolling finger wheel, can be programmed for any of 50 functions via Logitech's excellent MouseWare driver software. The finger wheel also lets you scroll up and down in most Win98 programs, and zoom in and out in documents. This combination of exceptional functionality and ergonomic comfort is unrivaled. MouseWare is easy to use, and the number of programmable functions is unmatched. We're at a loss to figure out how a mouse could get better and increase productivity more. *$41, www.logitech.com*

Logitech MouseMan+

Runner-Up Those on our staff who don't use the MouseMan+ use the Microsoft **IntelliMouse**. If space-age ergonomics aren't your thing, but you still want comfort and functionality, this mouse will serve you well. Three programmable buttons, including a scroll wheel, and a simple, traditional design make the IntelliMouse a solid contender. *$22, www.microsoft.com*

Epson Stylus Color 740

► Best Printer It was a toss-up which Epson Stylus Color ink jet we'd pick: the photo-quality 700 or the SOHO-oriented 740. Both deliver stunning prints at up to 1440x720dpi courtesy of Epson's Micro Piezo technology, which sprays the smallest ink droplet in the industry for crystal-clear, razor-sharp images. We went with the **Stylus Color 740** because it's more versatile: from photo-quality images to smooth gradients to laser-caliber black text, it does it all with aplomb. Its ink sprayers are the smallest yet—6 picoliters, for what it's worth—so it picks up subtleties in images other ink-jet printers can only dream of. The 740's flexible connectivity gives you legacy parallel and new-fangled USB ports for use with today's and tomorrow's computers. *$279, www.epson.com*

"We're at a loss to figure out how a mouse could get better..."

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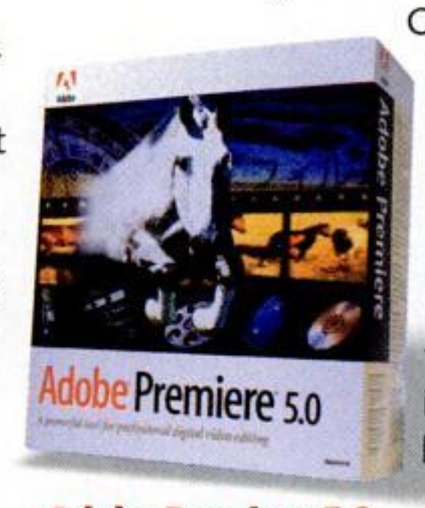
"Premiere brings pro-level tools to the desktop."

In addition to editing all game, utility, and application reviews, our rubber-jointed **software editor** *handles the magazine's digital-video coverage. He's a full-time flick freak and has grand designs on producing his own independent movie—shot on digital video, of course.*

RICK POPKO

▶ Best DV Software Top spot goes to Adobe **Premiere 5.0**, an app that truly brings professional-level editing tools to the desktop. Improvements from 4.2 include a complete rebuild that fosters third-party plug-in development, and fixes for sound syncing. Adobe has also redesigned the interface to more closely reflect pro-level editors such as Avid *Xpress*. Other new niceties: 32 levels of undo, projects can now be three hours long, and you can import *Photoshop* layers individually. Most significantly, *Premiere* now comes with 14 new audio filters including pan, chorus, flanger, and more. Received a 9/Kick Ass in September. *$895, www.adobe.com*

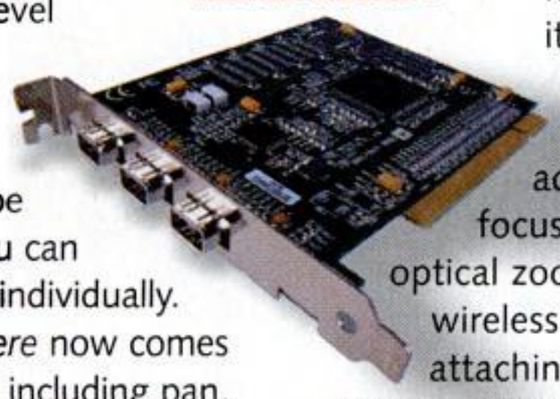
Runner-Up Ulead **Media Studio Pro 5** would have won top-spot earlier in the year, but was edged out by *Premiere 5.0*. To this day, I still use Ulead's bundled *Video Paint*, a rotoscoping tool that lets you paint individual AVI frames. You can do the same thing with *Premiere*, but you have to save your AVI as a film-strip, then import it into *Photoshop* to do the painting, then import it back to *Premiere*. This costs too much (*Photoshop* is $690) and is impractical for fluid animation. Other *Media Studio Pro 5* pluses include a robust character generator and an audio editor. *$600, www.ulead.com*



Adobe Premiere 5.0

▶ Best DV Hardware With a $1,200 hard drive array and the Radius **MotoDV** capture card, your computer can become a full-fledged post-production house for less than the cost of a professional Super VHS VCR. Using a IEEE 1394 interface for speedy throughput, the MotoDV encodes digital video to your hard drive(s) in the QuickTime 3.0 format. This video can then be edited in software such as *Premiere*. Features include forward/backward scan, frame-by-frame advance, motion capture, and the option to capture at 16:9. *$500 ($900 with Premiere 5.0 included), www.radius.com*

Radius MotoDV



▶ Best DV Camera The filmless Sony **DCR-PC10** has about the same features as our runner-up from Canon, but offers a much clearer picture due to its 680,000 pixel CCD (Canon's is 470,000 pixel). Other features include an adjustable LCD viewer, auto-focus, SuperSteady Shot, 12X optical zoom, accurate timecode, wireless remote, a thread for attaching filters and external lenses, and the ability to take digital still pictures. The DCR-PC10 is small and light and can take advantage of MiniDV CM (cassette memory), which can read and write information such as recording dates and titles. *$2,900, www.sel.sony.com*

Runner-Up While the Canon ZR is practically half the cost of Sony's PC-10, the image quality is noticeably lower when focusing on objects at close range. Still, it's packed with all the right features. *$1,500, www.canon.com*

Sony DCR-PC10

1998's Most Innovative Technologies

▶ A3D 2 Move behind a wall and the clanky din of distant war suddenly becomes muffled. That's what Aureal's new sound API gives you. They call it wave tracing, and it creates accurate audio modeling of 3D worlds. *www.aureal.com/index2.html*

▶ Chromeffects As Chrome guru Eric Engstrom told us, "Chromeffects is about making every picture or piece of HTML text exist in a 3D space and then animating it so that you can move it around, push it away from you, or pull it close." Microsoft says Chromeffects is the base technology for future GUI designs. Skeptical? If you think you don't need a better GUI, ask yourself if you said the same thing before Win3.1 morphed into Win95. *www.microsoft.com/windows/chromeffects/default.asp*

▶ K6-2 with 3DNow! By being the first out the gate with extensions to enhance floating-point operations in 3D games, AMD blew open the sub-$1,500 PC market and extended the life of Socket 7—just when Intel was ignoring inexpensive PCs and focusing on Slot 1. And who's backtracking now? *www.amd.com*

▶ MGA-G200 Naysayers said Matrox engineers couldn't do good 3D if their lives depended on it. But not only did Matrox resurrect its reputation with a great 3D accelerator, it also improved already great 2D performance. Comeback player of the year. *www.matrox.com*

▶ Rio PMP300 When Diamond's portable MP3 player hits store shelves, it'll change the way we groove. You can load MP3 files you've converted from CD, or grab already converted MP3s from the net, circumventing CD purchases entirely. That's why the recording industry has won a temporary court injunction to keep players like the Rio off the market. *www.diamondmm.com*

▶ Thin and Flat Wafer-thin notebooks set new portability standards. Second-gen flat-panel monitors eliminated nagging quality problems. New flat-screen CRT monitors reduce glare and distortion. Thin is in, and the world is flat.

▶ 100MHz System Bus Core-logic chipsets from Intel, VIA, and ALI widened the memory-to-CPU pipeline from 66MHz to 100MHz—a major bottleneck-buster in this age of faster processors and memory-intensive applications.

Does the thought of no partitions terrify you?

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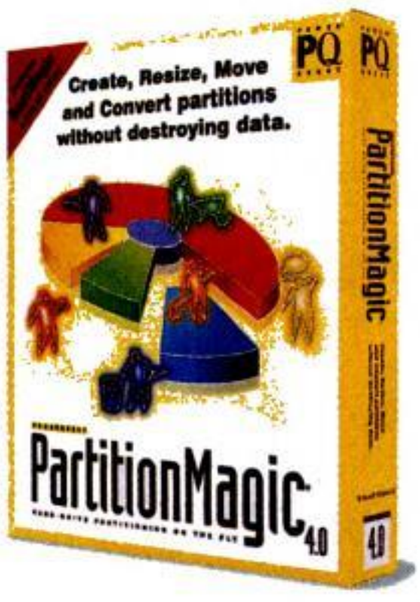

PartitionMagic 4.0 works with Windows 98 and includes a free copy of BootMagic. Buy it now and get $15 back from PowerQuest.

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SEAN DOWNEY

Our **departments editor** *writes utility and storage-device reviews, and is the surgeon general at the Doctor's clinic. He also edits the boot Report when his hands aren't covered with blood.*

▶ Best CD-R Drive ATAPI CD-Rs came of age this year to edge out the performance of their SCSI cousins. This is a big deal when you consider the expense of installing a SCSI controller in a PC that already has built-in EIDE support for ATAPI drives.

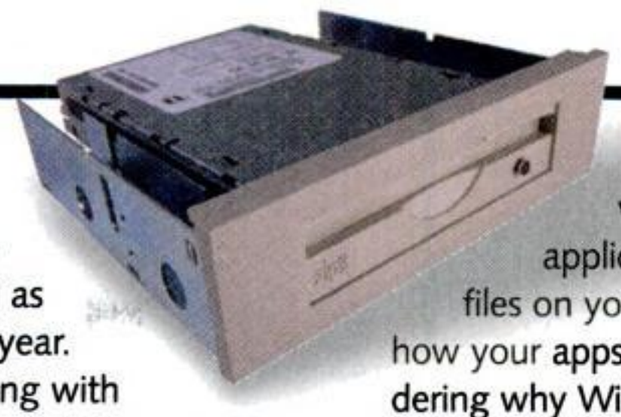
Both the HP CD-Writer Plus 8100i and Sony Spressa CRX100E/CH are suitable replacements for read-only CD-ROM drives, delivering 24x read speeds. Likewise, both support the entire alphabet soup of CD-R standards, burning CD-Rs at 4x and CD-RWs at 2x. And both ship with excellent software bundles featuring *Easy CD Creator*, *Direct CD*, and *HP Disaster Recovery* on the HP side, and *CD-Right!* and *Spressa Back-Up* on the Sony side. In fact, if it weren't for the different recording software, it would be hard to tell these two drives apart.

Since Sony's packet-writing software wasn't ready in time to ship with the Spressa, we chose the **CD-Writer Plus 8100i** as our best CD-R of the year. Still, you can't go wrong with either of these babies. *CD-Writer Plus 8100i, $350, www.hp.com; Spressa CRX100E/CH, $400, www.sony.com*

Runner-Up Pairing the Plextor PlexWriter with Plextor's **UltraPlex 32x CD-ROM** drive is the dual-Voodoo^2 of the CD burning world: You get bit-by-bit duplication of practically any CD in existence (see the UltraPleX write-up on page 62). Of course, all this comes at a price, and the PlexWriter is considerably more expensive than both the CD-Writer Plus and the Spressa. It also lags behind the ATAPI drives' performance specs, but is a rock-solid performer and the best SCSI CD-R hands down. *$640, www.plextor.com*

Nuts & Bolts 98

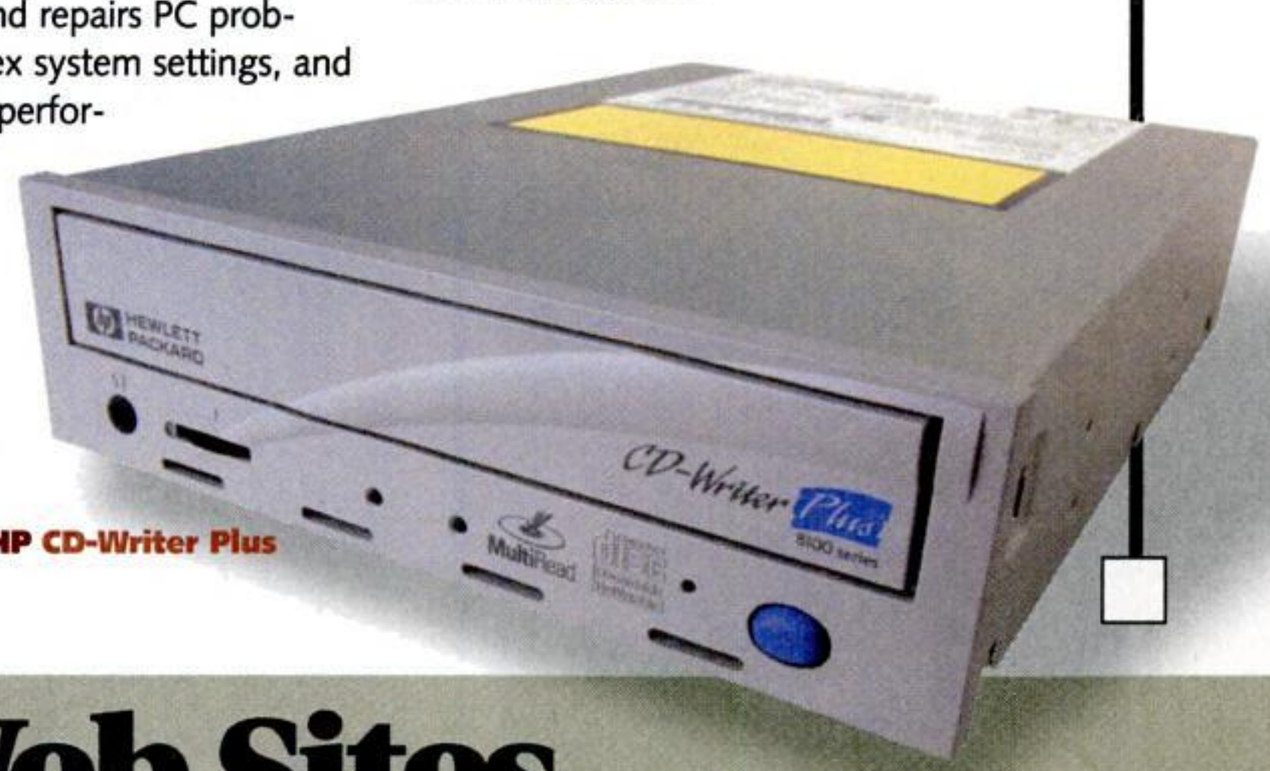
▶ Best Utility Where other utilities stop at minor system tune-ups, **Nuts & Bolts 98** from Network Associates bores out your registry, flushes your hard drive, and adds a nitrous kit to your PC. With a comprehensive collection of excellent tools, the software prevents and repairs PC problems, tweaks complex system settings, and optimizes Windows performance. The latest version improves on the original with new tools that resolve configuration problems in hardware and software, backs up and protects valuable files, and accelerates application launches by sorting files on your hard drive according to how your apps load them. If you're wondering why Windows runs sluggishly or why your apps keep crashing, you're not running *Nuts & Bolts 98*. Receives a 9/Kick Ass on page 102. *$40, www.nai.com*



Iomega Zip Drive

Runner-Up **Norton Utilities** is going through an identity crisis. While version 3.0 does a good job of cleaning, repairing, and optimizing your PC, it also sucks up system resources. Nonetheless, *Norton Utilities 3.0* earns high marks for a clean interface stuffed with lots of handy wizards to guide your system toward smooth-running nirvana. *$79, www.symantec.com*.

▶ Best Removable Storage The masses have spoken—Iomega's **Zip** drive is well on its way to becoming your PC's floppy drive replacement. Sure, the Zip only reads and writes at about 0.6MB per second, and the 100MB capacity looks small when compared to the 2GB Jaz or the 1.5GB SyJet. But popularity is the name of the removable storage game. With a Zip, you know you can save your vitals to disk and read them wherever you go. *$99, www.iomega.com*



HP CD-Writer Plus

Our Favorite Web Sites

▶ **www.gadgetguru.com** Page upon page of cool tech toys, digital and otherwise. Peripheral Vision to the nth degree.

▶ **www.passwordcorp.com** A nod's as good as a wink to a blind bat, eh? Go here for all those "hard-to-find" passwords to juicy sites.

▶ **http://sysdoc.pair.com** Tom's Hardware Guide is packed with breaking CPU and chipset coverage; a great source of daily silicon roughage.

▶ **http://terraserver.microsoft.com** An unfathomable database of satellite photographs; aerial shots so detailed, you can actually find your own home. The terraserver holds more than 1.01 terabytes of compressed images. Addictive as hell—and a technological marvel.

▶ **www.voodooextreme.com** A great resource for the latest news and links on 3D hardware and software. And it's not just 3Dfx- and Glide-related, either.

▶ **www.webgfx.ch** A miraculous online logo creator. Just type in your text string and designate your artsy flourishes, and the server will shoot you back a ready-made JPEG.

▶ **www.windrivers.com** Find elusive bus-master drivers, forgotten service packs, and those drivers for that videocard from that company that folded. All things 3.1, 95, 98, and NT.

▶ **www.theonion.com** Most online humor sucks, but the weekly Onion, a deft, cutting newspaper satire, is consistently fresh and hilarious—and much funnier than anything you'll see late on a Saturday night.

"A-", "...the best space-combat action game around."
- PC Games

"91%" "Freespace sets a new standard for sci-fi shoot'em ups with its first rate production."
- PC Gamer

"5 out of 5"
- Game Buyer

"9 out of 10" "Descent Freespace is the absolute best space-combat sim to date."
- Maximum PC

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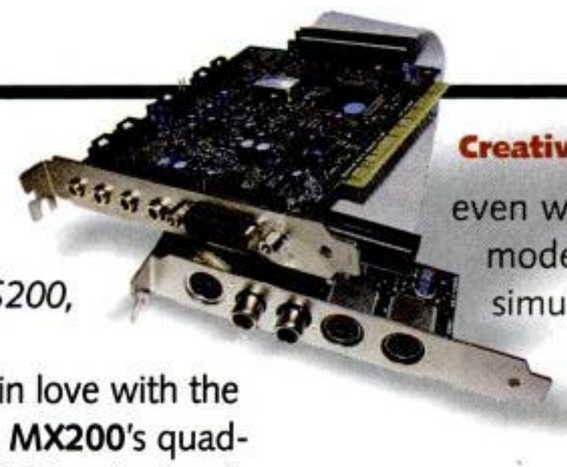
GORDON UNG

Our dead-pan **online editor** *manages all the content on our web site, writes all soundcard, modem, and scanner reviews, and takes the Watchdog for daily walks. He seems like a nice guy—so what's all this about a gun fetish?*

▶ Best Soundcard

Picking the Creative Labs **Sound Blaster Live!** was a no-brainer. It'll get you DirectSound, DirectSound3D, emulation for A3D 1.0, and Creative's own Environmental Audio API. The card also comes with a great software bundle, a freebie mike, and a digital I/O header with more connections than you can reach with your reaching broom. The effects engine alone is priceless, with settings such as "God" and "chipmunk." The best soundcard we've ever used received a perfect 10/Kick Ass in October. *$200, www.sblive.com*



Creative Labs Sound Blaster Live!

Runner-Up We fell in love with the Diamond **Monster Sound MX200**'s quad-speaker, A3D support and 64-voice hardware wavetable—but we couldn't forgive its finicky taste for joysticks. Still, it packs a great game bundle and some of the best MIDI we've heard care of a 4MB Roland patch. Received a 9/Kick Ass in September. *$150, www.diamondmm.com*

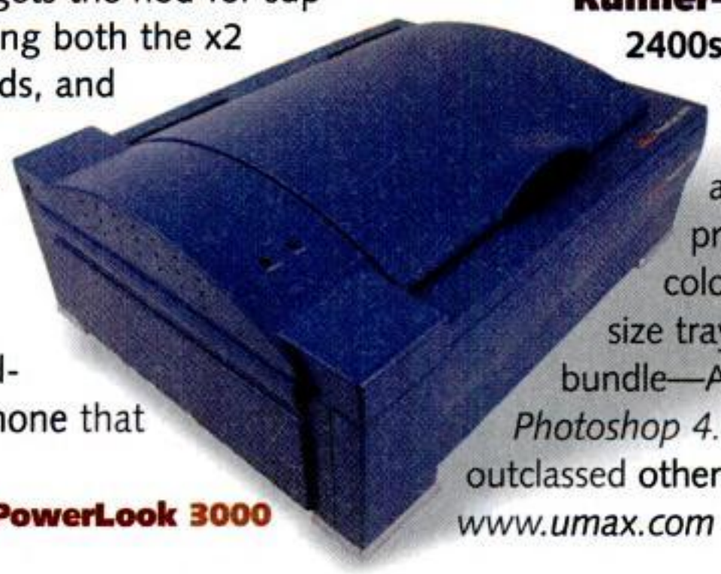
3Com Voice Faxmodem Pro

▶ Best Modem

Though initially plagued by a slow roll-out of USB drivers, 3Com's **56K Voice Faxmodem Pro** gets the nod for supporting both the x2 and V.90 standards, and boasts both a standard RS-232 port and the much-awaited USB port . The clincher is the full-duplex speakerphone that can be used even with your PC off. Full-duplex mode allows both parties to talk simultaneously, eliminating those annoying CB radio-like conversations. *$200, www.usr.com*

▶ Best Scanner

UMAX's **PowerLook 3000** may be prohibitively priced, but its quality can't be ignored. Like much more expensive drum scanners, the 3000 moves source material to and fro, while a fixed CCD remains steady to realize its full scanning potential. Hence 1220x3048dpi for full-page scans, and 3048x3048 for transparencies—drum-scan-level specs previously unheard of in the flat-bed arena. *$7,300, www.umax.com*



UMAX PowerLook 3000

Runner-Up The UMAX **Astra 2400s** was the obvious runner-up to its big, blue, pre-press cousin. The 2400s aced other scanners in its price class in sharpness and color processing, and its legal-size tray and kick-ass software bundle—Adobe *Pagemill 3.0*, *Photoshop 4.0 LE*, and *Acrobat 3.0*—outclassed others as well. *$500, www.umax.com*

BRAD DOSLAND

Maximum PC's rough-and-jovial **editor in chief** *spends 23 hours each day reading your fervent e-mail. He uses the 24th hour to write reviews of digital cameras and graphic design software, and make sure we don't print anything that can land us in jail.*

▶ Best Digital Camera

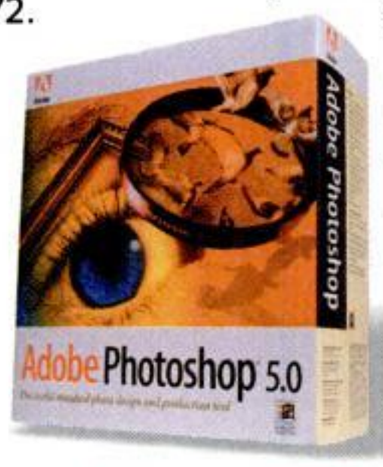
The Kodak **DC260** pulls together the most important features of any digital camera: a class-leading 1536x1024 CCD, great visual quality, and an intuitive interface. Kodak also goes the extra step with a powerful scripting language that allows you to program your camera to work the way *you* want. But perhaps the most unique feature is the external flash sync port that allows you to use the DC260 with studio lights or an off-camera flash for vastly superior pictures. Toss in CompactFlash storage, a USB option, IrDA transfers, the best software bundle around, and a great audio-note recorder, and the DC260 is the clear choice. Received a perfect 10/Kick Ass in November. *$1,000, www.kodak.com*

Kodak DC260

Runner-Up With its gorgeous 1600x1200 pictures and simple-yet-powerful interface, the Agfa **ePhoto 1680** made a solid run at the crown, but design flaws in the camera's bulky body kept it from the title. Also, the CCD upsamples from a merely mortal 1343x972. Received a 9 in November. *$900, www.agfa.com*

▶ Best Graphics Software

2D graphics, 3D graphics, vector graphics, raster graphics. The graphics software universe is so vast, it's tough to pick a single winner. So we decided to go with the app that best executes its intended mission: Adobe **Photoshop 5.0**, the king of image editors. Version improvements include multiple undos, character-level type control, editable copy (after it's been placed!), magnetic lassos, free-hand bezier pens, and a high-octane layers palette that creates bevels, glows, and natural drop shadows in a single click. Received a 9/Kick Ass in September. *$650, www.adobe.com*



Adobe Photoshop 5.0

Runner-Up Macromedia **FreeHand 8** knocked *Illustrator*, Adobe's vector-based offering, out of second-place contention. By adding incredible lens effects that have never before been available in one app, Macromedia presents a serious contender for first place. In fact, *FreeHand* only loses to *Photoshop* in versatility. Barely. *$400, www.macromedia.com*

60 ▶

"The Agfa ePhoto 1680 made a solid run at the crown."

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Top 10 Games of the Year

The boys name the sims, shooters, and strategy fests that consumed way too much time in 1998.

Brad Dosland

▶ ***Age of Empires***

Starting in the Stone Age and ending in the Bronze, this realtime strategy game's powerful engine allows my own personal variations—bizarre quirks that even surprised the game's creator, Bruce Shelley, on a visit to the *Maximum PC* offices. In one perverse move, I herd all of a defeated foe's workers into a walled-in space and seal it off. Then I have my priest convert some guy in the middle, and watch the gladiator carnage ensue. A nonstop loop of mauling and healing passes the time nicely. *$29, www.microsoft.com*

Andrew Sanchez

▶ ***Unreal***

While *Quake II* features drab and angry colors, *Unreal's* bright and wondrous palettes will make your 3D accelerator soil its silicon BVDs. With a breakthrough 3D engine, the game achieves a new level of graphical excellence and offers a great single-player experience in which you must survive against alien hordes bent on tasting your corpse. *$50, www.gtinteractive.com*

Rick Popko

▶ ***Forsaken***

In addition to extremely fluid movement—it's so realistic, it left some staff members with motion sickness—this 360-degree space shooter dishes out the most beautiful graphics I've ever seen in a game. Lighting nuances, detailed texture maps, and legions of creatively designed enemy forces left me hypnotized with dread. Even more impressive was the enemy AI, which has ships retreating when fired upon and advancing again when your guard is down. *$50, www.acclaimnation.com*

Sean Cleveland

▶ ***Quake II***

No game stands out in 1998 like *Quake II*. Period. I fought hard among the boys to make this my choice, and I fight hard on our Lithium *Quake II* server every night. Nothing matches this game for multiplayer intensity—hats off to id for giving us a front-end that allows us to practice and polish our stalking skills. With new player clans, modifications, levels, and *Quake II* engine-based games popping up daily, *Quake II* is more than just a game. *$55, www.idsoftware.com*

Bryan Del Rizzo

▶ ***Triple Play 99***

The best sports sim I've played, bar none. From the 3D renderings of all the major-league parks to the insanely realistic play-by-play and color commentary by Canadian broadcasters Buck Martinez and Jim Hughson, *Triple Play 99* looks and sounds so much like the real thing, it's scary. Add in excellent gameplay and AI, and you've got yourself a World Champion. *$50, www.easports.com*

Gordon Ung

▶ ***Descent Freespace: The Great War***

You'll be battle weary by the second disc. Although flight games can be as complicated as pre-flighting a helicopter, *Descent*'s training missions gingerly walk you through to scrub level. It's everything *X-Wing vs. TIE fighter* should have been, and its fantastic implementation of A3D 1.0 has to be heard on headphones to be believed. *$50, www.interplay.com*

Kenn Durrence

▶ ***Jedi Knight***

This gem of a game is defined by beautifully conceived, vertigo-inducing levels. *Jedi Knight* is also the first shooter in which you choose a moral path that ultimately affects which powers you develop. Light side of the Force or Dark? And can you honestly say that you're not tempted to follow in Vader's shoes? Moral conundrums and ingenious level design bring me back time and again. *$40, www.lucasarts.com*

Jon Phillips

▶ ***Madden 99***

First criteria: I'm going to pick a football sim. Second criteria: I need complete pro playbooks, the ability to see all my men as plays unfold, and a basic difficulty level that allows me to score on both the run and the pass, and still be challenged by AI offense—regardless of any logic holes I might learn to exploit. *Madden 99* looks great, sure, but I dig it because it tricks me into thinking I'm actually playing ball. *$50, www.easports.com*

Sean Downey

▶ ***Wing Commander: Prophecy***

Prophecy is a different breed of *Wing Commander*, filled less with cinematic plot lines and more with white-knuckle gameplay. With its gorgeously refurbished graphics engine, Origin made new fans out of the space jockeys left cold by LucasArts' limp-wristed *X-Wing vs. TIE Fighter*. Although I finished the game earlier this year, the release of the Secret Ops episodes brought me back. The fact that Origin made this game-length mission pack freely available on the Internet is the coolest event of the year. *$20, www.origin.ea.com*

62

Sean Cleveland kicked this guy's ass.

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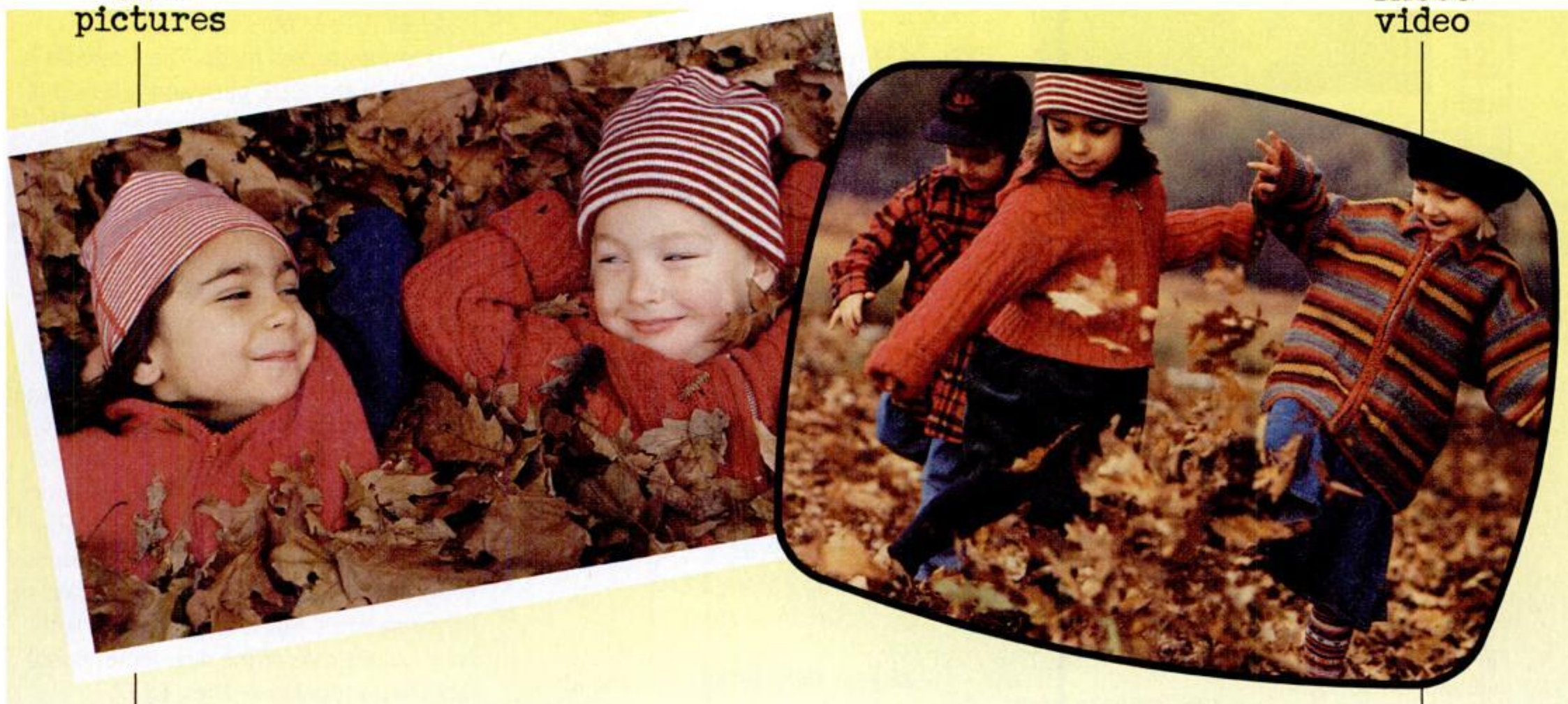

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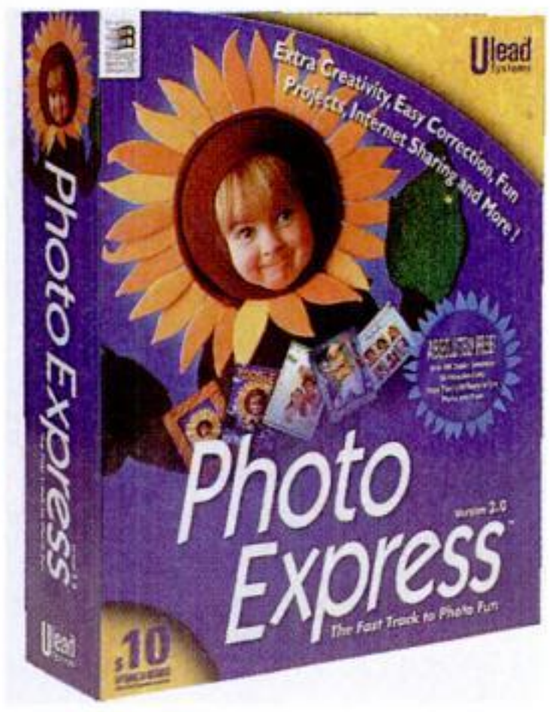

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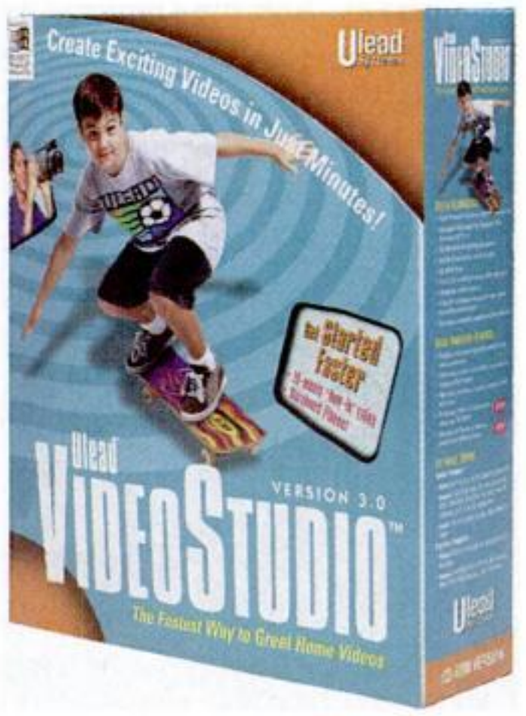

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SEAN CLEVELAND

Our Montgomery Scott of a **technical editor** *likes locking himself in the lab to benchmark CD-ROM drives, hard drives, and DVD kits. Other hobbies include comic-book speculation and debating the age-old question, What wins in a bar fight, swords or sorcery?*

► **Best CD-ROM Drive** You can't argue with benchmarks. The superlative Plextor **UltraPleX PX-32TS** delivers average read speeds around 24x, topping out with a maximum score of 37x. Using a SCSI-2 interface, the UltraPleX also holds the speed record for Redbook audio extraction—no other drive can convert CD audio music to WAV files at 24x with excellent quality. And the UltraPleX reads everything, offering the most media support we've ever seen.

It gets better: With bundled *PlexManager* software, you can connect the UltraPleX to Plextor's PlexWriter 4x12 CD-R drive for "bit accurate" copies—which means you can copy Mac discs on your PC. The latest version of *PlexManager* also allows you to see CD music tracks as WAV files instead of CDA files, meaning you can copy CD music via Explorer without having to first convert it with third-party software. The PX-32TS is simply the most complete CD-ROM drive we've ever used. *$239, www.plextor.com*

UltraPleX PX-32TS

Runner-Up Using Zen Research's TrueX technology, the superfast HiVal **40x40** splits the laser that would normally only read a single track of data into seven beams that read seven tracks in parallel. This allows the drive to spin at relatively slow rotational speeds and take advantage of CLV technology, which ensures true 40x performance across the entire disc. The 40x40 would have taken first place if it read CD-RW media, had a faster random-access read, and didn't have problems with line noise on some motherboards. Received a 9/Kick Ass in September. *$130, www.hival.com*

Hi-Val DVD-3 Kit

► **Best DVD Kit** The Hi-Val **DVD-3** kit contains Sigma Designs' Hollywood+, the best MPEG-2 decoder card around. The Hollywood+ delivers thundering AC3-quality audio and an extremely sharp picture that even looks great on a computer monitor. The kit is anchored by Toshiba's SD-M1202 third-gen DVD-ROM drive. While spec'd to hit 4.8x DVD performance and 32x CD-ROM performance, the SD-M1202 only clocked 2.2x and 19x, respectively. Still, this bests the CD-ROM reads of the contenders. You also get a good software bundle care of the new James Bond flick, *Tomorrow Never Dies. $347, www.hival.com*

► **Best Hard Drive** Spinning at 10,000RPM and based on the Ultra 2 SCSI LVD spec, the Seagate **Cheetah 9GB** has the benchmarks to prove it's the fastest hard drive available. Average read speeds clocked at 16MB/sec; average writes smoked at 19.3MB/sec. Random-access seek times were an extremely low 8.3ms, while CPU utilization hovered around 6%. And data bursts hit up to 43MB/sec! Whoah! *$790, www.seagate.com*

Runner-Up The 14.4GB IBM **DeskStar 14GXP** delivers awesome performance for the buck. Spinning at 7,200RPM and using the Ultra ATA/DMA interface, the drive hit 12MB/sec average reads, 16MB/sec average writes, 28MB/sec bursts, and 11.7ms random-access reads. The DeskStar is the best of the EIDE pack and received a perfect 10/Kick Ass in November. *$455, www.storage.ibm.com*

65

Cheetah 9GB Hard Drive

"Cheetah 9GB: The fastest hard drive available."

Worst Technology of '98

► **Apple iMac** This prissy little pissant might be the worst product of the year, if only for the precious hype that accompanied its launch. Yes, it's been selling like hotcakes—to idiots who don't know dink about expansion and why it's important. You can't add PCI cards, SCSI devices, an external monitor, or even FireWire devices—and FireWire is an Apple technology in the first place!

► **Windows CE 2.0** Promising to address the bloat that plagued the first version of Microsoft's mobile OS, CE 2.0 sadly perpetuates the memory-hungry legacy. Look no further than this month's review of the MobilePro 7750c. A 135K PowerPoint file ballooned to 678K when transferred from Win98 to CE 2.0. And the OS itself hogs a whopping 8MB of system memory.

► **DVD Recordable Spec Wars** We're now faced with three different DVD recordable technologies, all competing for the consumer buck. DVD-RAM, a forum-approved standard, isn't compatible with standard DVD-ROM drives. DVD +RW, often touted as superior, is nowhere to be seen. And Pioneer's DVD-RW offers compatibility because it writes discs closest to the spec from which DVD-ROMs are made, but hasn't yet arrived and promises to be too pricey when it finally hits shelves.

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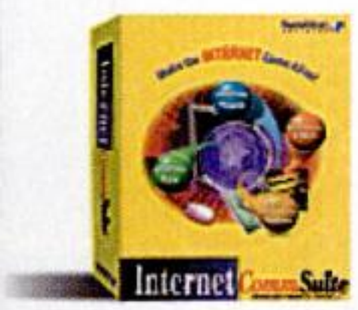

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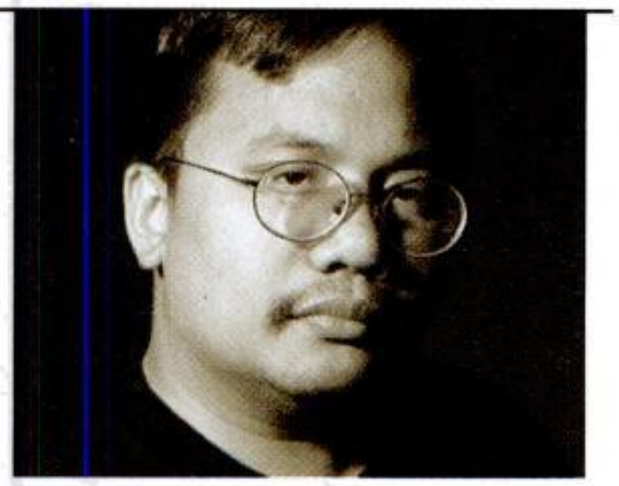


ANDREW SANCHEZ

He might focus on 3D accelerators, but our **senior editor** *is also knee-deep in motherboards, speakers, and CPUs. Easily riled, nothing gets him more upset than misleading benchmarks and low-res textures. Smithers!*

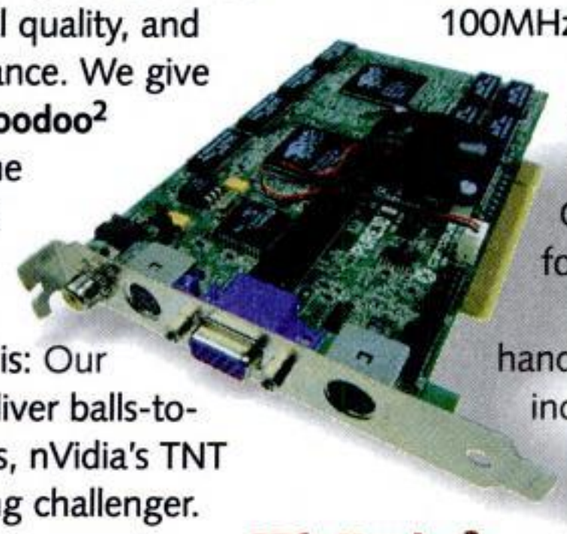
► Best 3D Accelerator The distinction goes not to a single card, but an integration of three: a 3D acceleration rig that provides complete software support, excellent visual quality, and record-setting performance. We give you two 12MB 3Dfx **Voodoo²** cards running in Scanline Interleave Mode, piped through whatever 2D card suits your fancy.

It comes down to this: Our 1998 winner had to deliver balls-to-the-wall framerates. Yes, nVidia's TNT chipset was a compelling challenger. It offers 24-bit z-buffer accuracy, AGP 2x compliance, large texture support, and integrated 2D functionality in single cards that cost less than $200. Voodoo², meanwhile, is limited to a 16-bit z-buffer, rides only the PCI bus, supports a maximum texture size of 256x256, and requires a separate 2D card.

Two Voodoo² cards running in tandem, however, form an incredible powerhouse capable of pushing games into the 1024x768 realm at 60fps+. Under 1024x768 *Forsaken*, dual-Voodoo² SLI can reach 80fps—TNT musters only about 70fps. And under 1024x768 *Quake II*, SLI gives you 74fps+—TNT gets to around 40fps+. You'll need this kind of power as new games become more demanding.

Voodoo² supports D3D, GL gaming, and 3Dfx's own native Glide API, making it the most software-friendly accelerator to date. Ultimate speed and software support. That's the 3D-acceleration story for 1998. *$230 for two 12MB cards (in addition to your stock 2D card), www.3dfx.com*

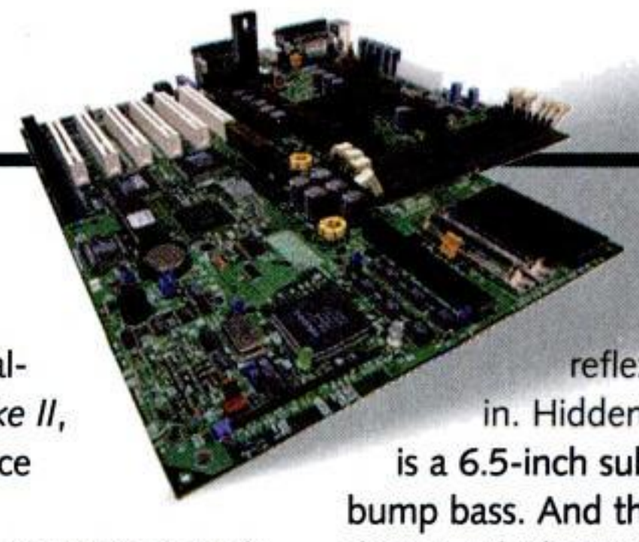
Runner-Up With a dual 32-bit graphics pipeline capable of performing multi-texturing and bump-mapping in a single pass, the nVidia **TwiN Texel (TNT)** chipset wrecks shop without resorting to mounds of silicon. It may not have the might to take on dual-Voodoo² SLI under *Quake II*, but its overall performance can't be denied. nVidia managed to stuff all this power in a single 0.35-micron fab chip, so it's no surprise that the TNT is the fastest integrated 2D/3D solution ever benchmarked. The TNT-driven STB Velocity 4400 received a 9/Kick Ass in November. *$200 for 16MB board, www.nvidia.com*



3Dfx Voodoo²

► Best Motherboard The beefy Tyan **S1836DLUAN Thunder 100** includes just about everything a growing Pentium II system needs: dual-processor support, one AGP slot, six PCI slots, an integrated Adaptec SCSI controller, four DIMM slots in support of 1GB of memory, and Intel's 440BX core-logic chipset in support of a 100MHz system bus—all in an ATX formfactor that accommodates full-length expansion cards. Heck, there's even a Creative Labs Vibra 16 aboard for legacy sound support.

The Thunder 100 can handle the entire Pentium II family, including Celerons if you're so inclined. And with its point-and-click AMI BIOS, you can easily overclock the system bus past 100MHz for extra gusto. *$550, www.tyan.com*



Tyan Thunder 100

Runner-Up If you don't need the bright lights and big SCSI of the Tyan Thunder 100, go for the Abit **BX5**, a 440BX-based board with one AGP slot, four PCIs, and two ISA. (If you'd rather have one more PCI slot in exchange for an ISA, you can go with the Abit BH6). The kicker is Abit's secret sauce: soft-jumper overclocking makes this the darling of the tweaker crowd. *$112, www.abit.com.tw*

► Best Speakers The Cambridge SoundWorks **MicroWorks**, a three-piece subwoofer/satellite combo, is probably the most sought-after multimedia speaker system in the *Maximum PC* offices. Available in either beige or black, the MicroWorks are physically small but sound anything but puny.

The sonic sorcerers at Cambridge have crammed greatness into their wee four-inch cone satellites. With crystalline highs and rich midrange (and even a bit of midbass), the only things these desktop dynamos can't do is deep bass. That's where the massive single-reflex band-pass box comes in. Hidden inside this vented box is a 6.5-inch subwoofer just aching to bump bass. And thanks to the band-pass design, which acts as a natural frequency filter, the bass is loud and efficient. A 67-watt bi-amped system and remote volume control complete the package.

The MicroWorks prove just as awesome detonating *Shogo*'s nuclear arsenal as swinging to Louis Prima. These are the best around. *$250, www.hifi.com*

Runner-Up Recently bought by Midiland to fill its super-duper high-end niche, Diamond Sound's S2 line of multimedia speakers brings innovation and excellent sound to the PC. The **S2 4100** sports a massive eight-inch woofer housed in a vented enclosure, while each hefty, sealed metallic satellite houses a 4.5-inch midrange/tweeter combo. The really swank thing about this 100-watt system—besides excellent sound and dynamic bass—is the drive-bay mountable or free-standing pre-amplifier. Resembling a high-end car-audio pre-amp, this little box of knobs controls master volume, as well as bass, treble, and other sonic attributes. A most excellent, albeit expensive, speaker system. *$400, www.midiland.com*

Cambridge SoundWorks MicroWorks

ATI RAGE FURY

The 32MB Ultimate Game Card

We know playing games is serious business, and this is one serious gamer card. With 32MB of memory on-board. More advanced 3D and 2D features built-in. More speed, more performance, more realism and heart-pounding excitement than you ever thought possible. The new ATI RAGE FURY delivers better-looking, more compatible gaming performance than cards costing hundreds more.

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- 32MB of memory for realistic gameplay with massive textures and high resolution
- Full OpenGL ICD, Direct 3D and DirectX 6.0 support for all your favorite 3D applications and games
- Advanced 3D features including line and edge anti-aliasing, double buffering, gouraud shading and multi-texturing
- Full 3D acceleration in all modes, all color depths, and all resolutions up to 1920x1200
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ATI XPERT 128

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ATI brings striking graphics performance to home, small office and home-based business PCs. With 16MB of memory on-board, AGP 2X graphics, brilliant 2D acceleration and a massive list of superior 3D performance features and visual enhancements, the ATI XPERT 128 is in a class all by itself. In fact, it's the best all-round graphics upgrade you can buy today.

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- 16MB of memory radically improves speed and appearance
- Full support for Direct 3D and OpenGL for all your favorite graphics-intensive 3D games and applications
- Advanced 3D features including line and edge anti-aliasing, double buffering, gouraud shading, multi-texturing and bilinear/trilinear filtering
- Full 3D acceleration in all modes, all color depths, and all resolutions up to 1600x1200
- Full-frame, full-screen MPEG-2/DVD playback without the need for additional hardware

ATI RAGE MAGNUM

Professional Power Plus

It's a whole new generation of hyper-performance PC graphics accelerator for NT workstations. With blinding speed, extensive in-hardware features and much more bang for the buck than ever. The new ATI RAGE MAGNUM delivers smoother animation and richer, faster, more accurate content design.

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- Fully featured OpenGL ICD optimized to provide superlative performance for professional graphics, 3D animation, CAD/CAM and visualization
- Advanced graphics architecture with SuperScalar Rendering, line and edge anti-aliasing, gouraud shading, Twin-Cache, Single-Pass Multi-Texturing and bump mapping
- Full 3D acceleration in all modes, all color depths, and all resolutions up to 1920x1200
- Built-in hardware DVD for full-frame, full-screen DVD playback

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GRAPHICS BY ATi rage 128

The New Breed of Speed.

ATi®

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www.real3d.com

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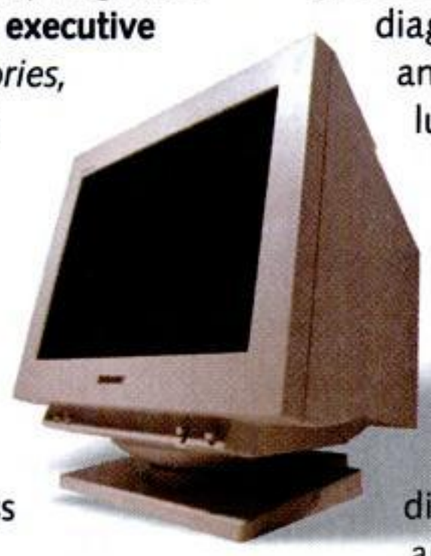
JON PHILLIPS

Last year he was obsessed with organized crime. This year he's deadening those annoying "pain" nerves in his shins with Muay Thai kicks to a heavy bag. And every once in a while, our **executive editor** *develops feature stories, directs CPU coverage, and reviews monitors.*

► Best Monitor The latest flat-screen technology puts traditional monitors to shame. In fact, we'd be hard-pressed to grant a Kick Ass award to any bulbous, convex monitor ever again. Flat-screen monitors reflect less glare, suffer less geometric distortion, and present flat computer images the way they were meant to be displayed—flat. The 21-inch Sony **GDM-F500** is the king of the new flat screens, offering incredible performance and controls. The F500's bright, brilliant aperture grille boasts a breakthrough 0.22mm grille pitch, which is amazing considering history's heretofore tightest grille pitch was 0.25mm. The monitor also hits 85Hz@1600x1200 and 80Hz@1800x1440, and refreshes as high as 160Hz. High-end designers will love the USB hub, BNC connectors, RGB controls, and color-convergence adjustments. *$1,900, www.ita.sel.sony.com*

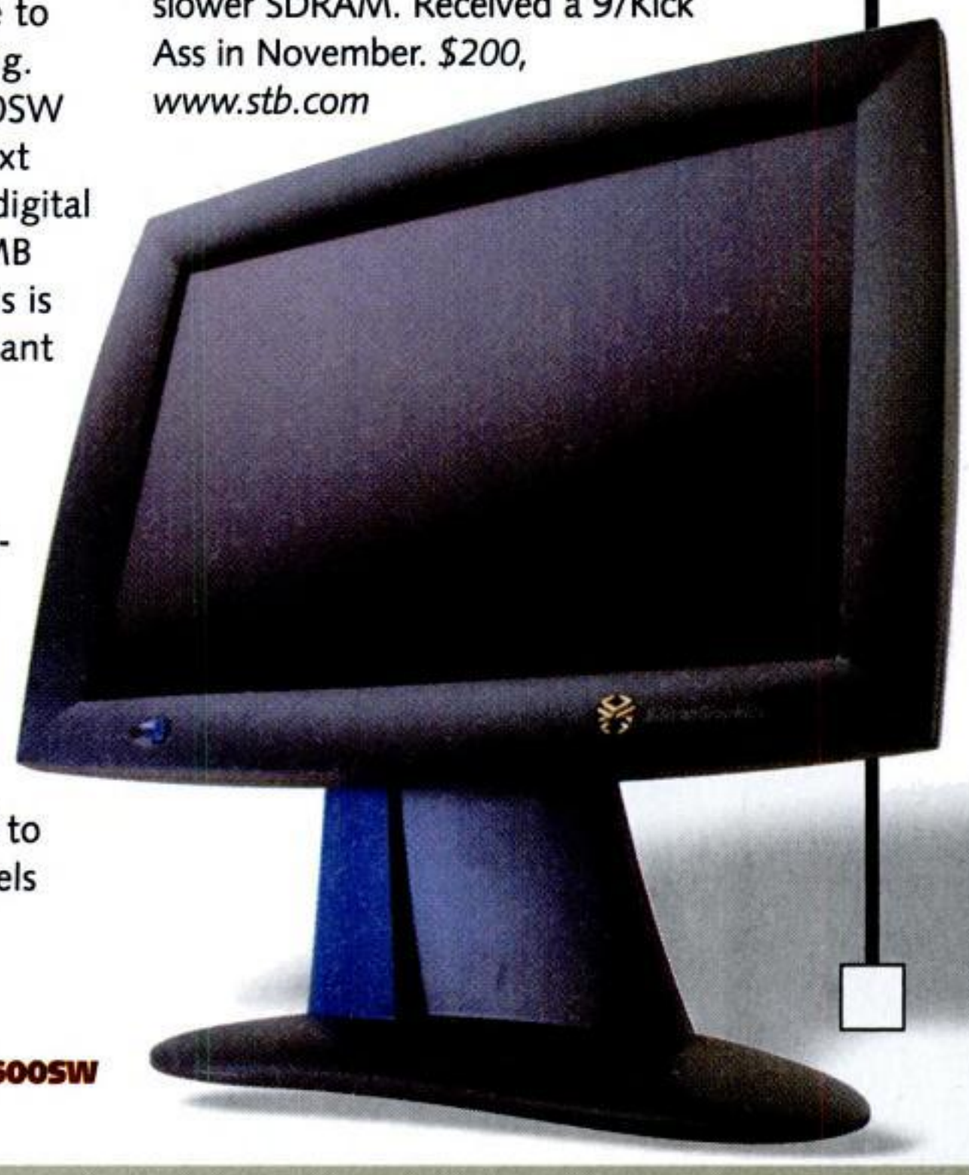


Sony GDM-F500

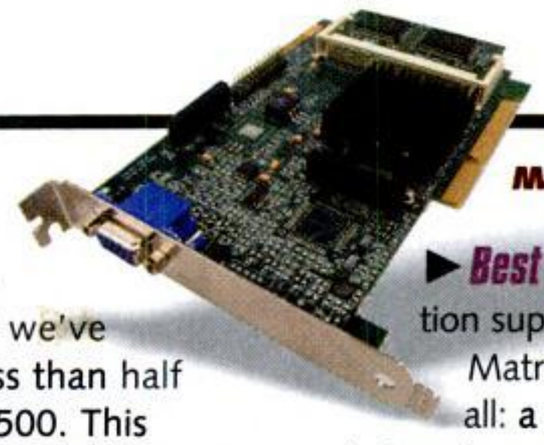
Runner-Up The Mitsubishi **Diamond Pro 900u** is the second-best flat-screen monitor we've ever seen—and costs less than half the price of the GDM-F500. This wunder-flatty offers less geometric distortion than the F500, but can't challenge the Sony's razor-sharp focus, and suffers from slight moiré and color convergence problems. *$800, www.mitsubishi-display.com*

► Best Flat Panel The Silicon Graphics **1600SW** may be the most stunning product released in 1998. The 17.3-inch diagonal, wide-aspect screen boasts an unprecedented 1600x1024 resolution, yet smaller resolutions can be had with absolutely no scaling degradation. The panel also achieves true 24-bit color (other flat panels dither) and cranks fast enough pixel response to play video without glitching. Most significantly, the 1600SW displays pristine, noise-free text and images care of the pure digital interface on the bundled 32MB Number Nine Revolution IV-FP. This is the first flat panel that makes us want to ditch our CRT monitors. Unfriggin'-believable. *$2,600, www.sgi.com*

Runner-Up The 15-inch diagonal Compaq **TFT500** may use an analog interface, but suffers very little pixel noise and displays excellent grayscale and color reproduction. It also comes at a great price and was the only panel to receive a 9/Kick Ass out of 11 panels reviewed in October. *$1,200, www.compaq.com*



Silicon Graphics 1600SW



Matrox Millennium G200

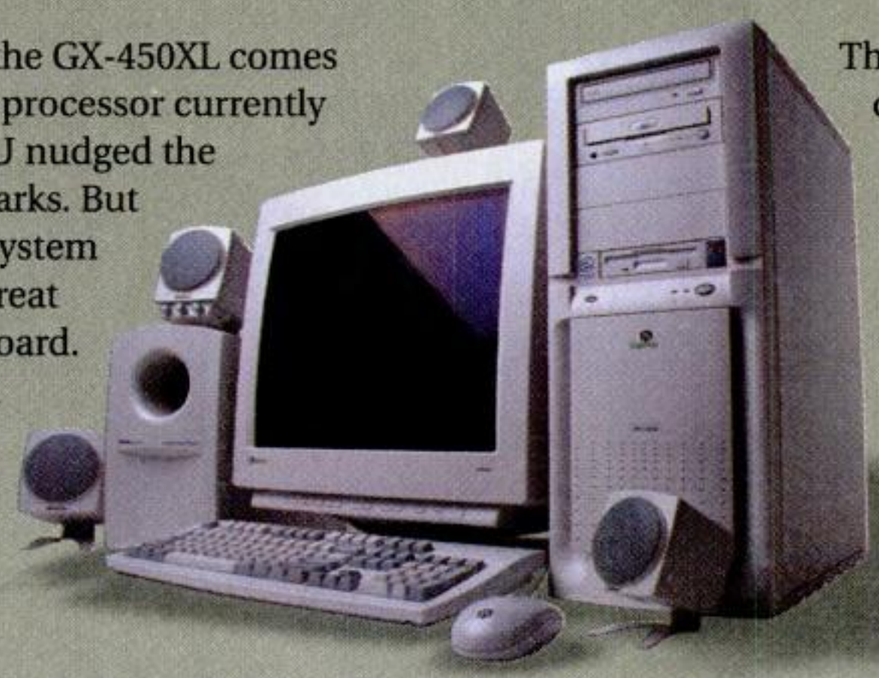
► Best 2D Videocard With resolution support up to 1900x1200, the Matrox **Millennium G200** has it all: a dual 64-bit architecture designed specifically for 2D acceleration, 16MB of lightning-fast SGRAM, and a 250MHz RAMDAC that helps the card achieve flicker-free refresh rates at high resolutions and color bit-depths. We use the G200 as our source board for all monitor testing; its excellent video bandwidth is tops in the 2D arena. And the card does excellent 3D as well. Received a 9/Kick Ass in September. *$228 for 16MB version, www.matrox.com*

Runner-Up The 16MB **STB Velocity 4400** is the best integrated 2D/3D card around. With a top resolution of 1920x1200 and a 250MHz RAMDAC, this TNT-driven card only falls short of the G200's 2D capabilities by going with slower SDRAM. Received a 9/Kick Ass in November. *$200, www.stb.com*

System of the Year

Gateway GX-450XL Sure, the GX-450XL comes with a 450MHz Xeon, the fastest processor currently available. And, yes, the Xeon CPU nudged the 450XL to record-setting benchmarks. But we actually chose this Gateway system for its expansion potential and great component choices across the board.

The motherboard comes with six PCI slots, two of them free, and a second CPU slot for dual-proc madness down the line.



The roomy case features five open 3.5-inch drive bays and two open 5.25-inch bays, and is stuffed with 128MB of RAM, a 16MB TNT videocard, a CD-ReWritable drive, a DVD-ROM drive, and a 14.4GB hard drive. And, wow, you even get a Dolby Pro Logic speaker system. With top-of-the-line parts from top to bottom, this excellent system benchmarked better than other machines reviewed in 1998. Receives a 9/Kick Ass on page 90. *$3,999, www.gateway.com* ✹

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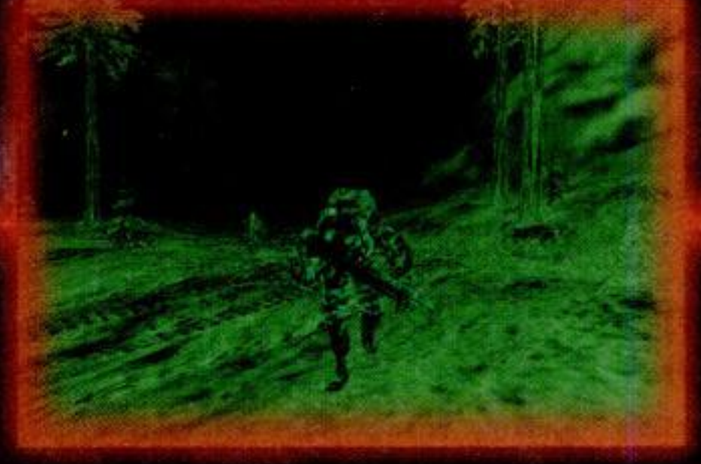

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Better gameplay doesn't require rocket science. The right controller gives you all the lift-off you need.

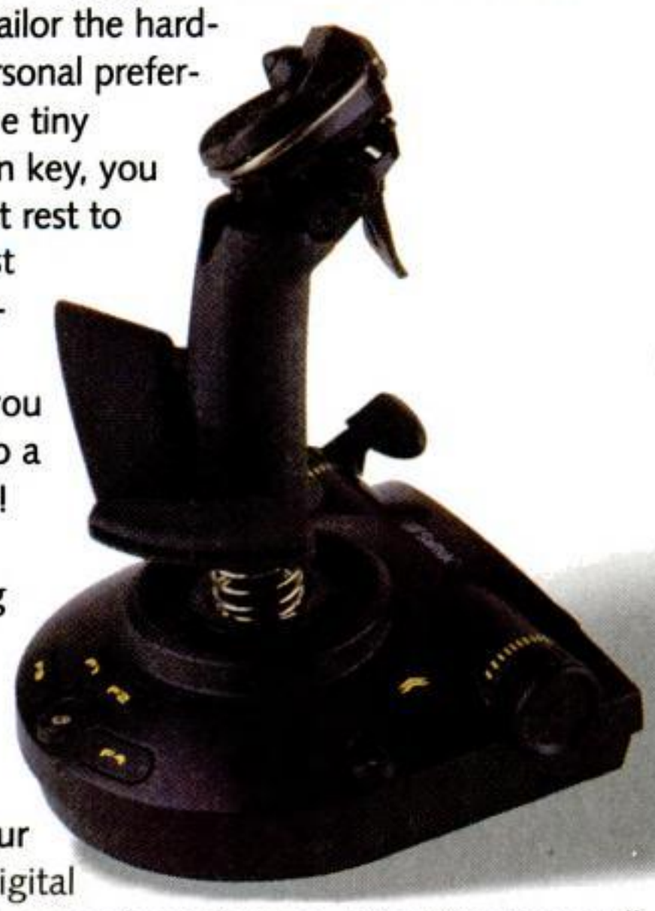
Jimmy uses a keyboard. Timmy uses a game controller. Timmy kicks Jimmy's ass on a daily basis—because Timmy has superior technology. Sort of like firing a laser satellite at a guy who's still trying to unsheathe his whittling knife. When you have the right controller for the right game, you're handicapped only by your own abilities. Joysticks are perfect for navigation and weapon attacks in flight sims; add a throttle for thrust control. Gamepads are general-purpose workhorses that excel in sports sims. And wheel/pedal combos turn driving games into the Daytona 500. Here's 11 new controllers. Pick one, and kick Timmy's ass.

JOYSTICKS

▶ Cyborg 3D

MAXIMUM PC KICK ASS! product

The Cyborg 3D offers a breadth of programming and customizing options unmatched by other controllers in its class. It's also the only joystick we've seen that allows you to literally tailor the hardware to suit personal preferences. Using the tiny integrated Allen key, you can move the wrist rest to one of five heights, or adjust the tilt and angle of the joystick head. And by flipping the throttle and wrist rest, you can turn the Cyborg 3D into a left-handed controller. Neat!



Other features include precise digital control along all three axes, and 10 fire buttons, including a trigger, miniature throttle, and eight-way hatswitch (which was too loose for our liking). The Cyborg 3D is digital by design, but gamers with a penchant for non-DirectX games will still be able to use the stick as a two-axis, four-button controller thanks to an analog-only switch on the nicely weighted base.

We were mighty impressed with the Cyborg's in-depth yet intuitive programming interface. Press, release, and timing functions can be applied to any of the buttons, and if you're a Programmer de Sade, you'll be happy to know there isn't a theoretical limit on the number of keystrokes that can be assigned to each of the buttons. We stopped counting at 200. Overall, the Cyborg 3D is a unique, and likely to be coveted, controller.

—BDR

MAXIMUM PC VERDICT

Price $70
Company Saitek
Phone 310.212.5412
URL www.saitekusa.com

9

▶ GenX 700K

The GenX 700K has impressive specs: digital operation, multi-view hatswitch, twist rudder control, a weighted base, and a full-sized BioThrottle (for people who require throttles with fancy names). So imagine our surprise when we discovered the unit isn't programmable, despite its required keyboard interconnect. To make matters worse, you can't actually use all the features simultaneously—you must toggle between modes to make use of either the throttle or hatswitch (Quickshot says an upcoming USB version won't have this limitation). What's worse, you can't even switch modes on the fly. Instead, you must manually change control properties in Win98. There are three digital mode selectors—for Hat, Rudder, and Full—on the bottom of the base, but we were afraid to touch them during gameplay, because if the wrong mode is selected, the OS will tell you that "your joystick is not configured properly" and interfere with gameplay.

The GenX 700K has four buttons on the handle (including a trigger) and four on the throttle. In digital mode, the buttons are mapped to *Mech Warrior II* keyboard commands that can't be changed. Most games have their own set of proprietary keystrokes, so we're perplexed as to why these commands were hard-coded. With a confusing manual and ridiculously large footprint, the GenX 700K really isn't worth your trouble.

—BDR

MAXIMUM PC VERDICT

Price $50
Company QuickShot
Phone 408.263.4163
URL www.quickshot.com

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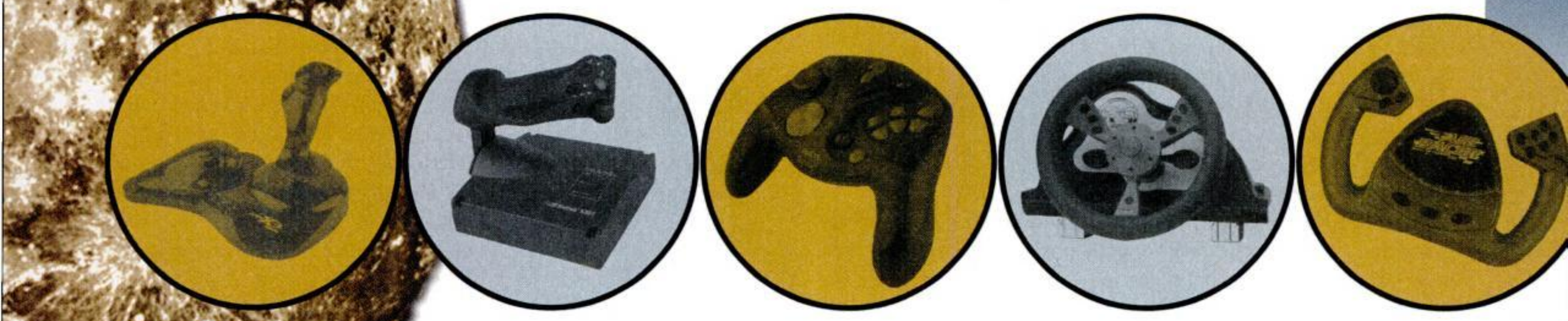
CONTROL

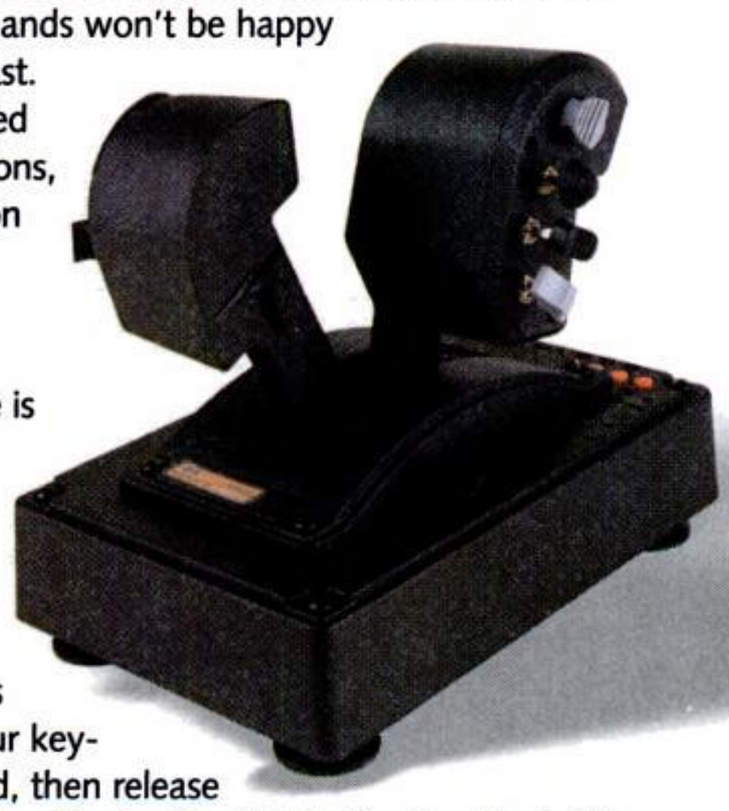


by Bryan Del Rizzo and Andrew Sanchez

THROTTLES

► Strike Fighter Throttle

Chiseled from a massive handful of plastic and modeled after actual F-15 technology, the Strike Fighter Throttle is intended for hardcore flight sims. The dual throttle system allows Top Gun wannabes to exact individual control over the in-board and out-board engines of twin-engine airplanes (if the game supports it). This mean machine was designed for authenticity rather than ergonomics, so small hands won't be happy grappling with the beast.



The throttle is riddled with hatswitches, buttons, and knobs that function as keyboard triggers capable of processing multiple keystrokes. Thankfully, the throttle is programmed via a simple four-step process: Put the throttle in program mode, press and hold a throttle button, press any of the keys on your keyboard you wish to bind, then release the button. You can also attach a joystick to the throttle to take advantage of its keyboard programmability.

In Jane's *Israeli Air Force*, the throttle worked as advertised, providing precise control. Too bad Suncom didn't provide a proper paper manual—instructions are on CD-ROM. Had the Strike Fighter Throttle been a pure DirectInput digital device, with each button recognized as an action button, it would kick major ass. As it stands, it's a keyboard-emulating superfluity. We like the dual-engine control, but the device simply lacks versatility.

—*AS*

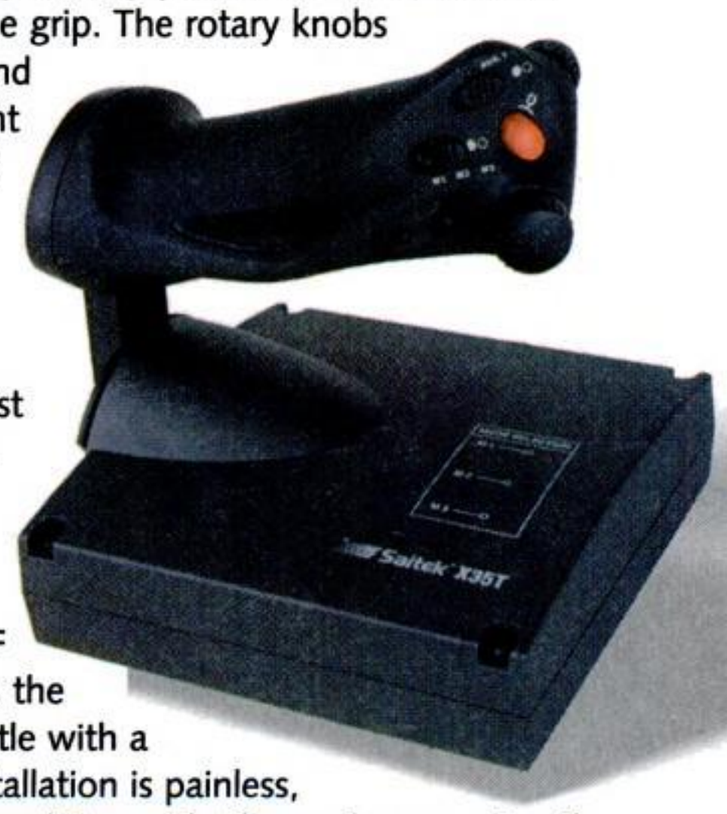
MAXIMUM PC VERDICT

Price $70
Company Suncom
Phone 847.229.0002
URL www.suncominc.com

7

► X35T

The X35T's smooth, curved throttle feels great and is home to the controller's entire button set. Your thumb will get the heaviest workout care of six controls, including a triple-position mode switch, rotary knob, and mini cursor controller. Your fingers, meanwhile, get to play with a second rotary knob, a hatswitch, and an ingeniously placed rudder control on the bottom front of the grip. The rotary knobs can be used to raise and lower antennas in flight sims that support that function.



Beware: Many of the functions—such as the mode selector, rotary knobs, and, most importantly, programmability—are only available when you use the X35T throttle with Saitek's $70 X36F flight stick. Otherwise, the X35T is merely a throttle with a couple of buttons. Installation is painless, although you'll need a splitter cable if you plan on using the X35T with any stick besides the X36F (and please note that all throttle/stick scenarios require a dual-port device interface).

Without the X36F at its side, the X35T worked its magic as a simple throttle, dialing in proper speeds in various flight sims. The ergo-grip is comfortable during prolonged gameplay, and the positioning of all the controls couldn't have been better. Despite the lack of free-standing programmability, the Saitek X35T is a great little throttle. Throw in the X36F joystick, and you've got a killer combo.

—*AS*

MAXIMUM PC VERDICT

Price $70
Company Saitek
Phone 310.212.5412
URL www.saitekusa.com

8

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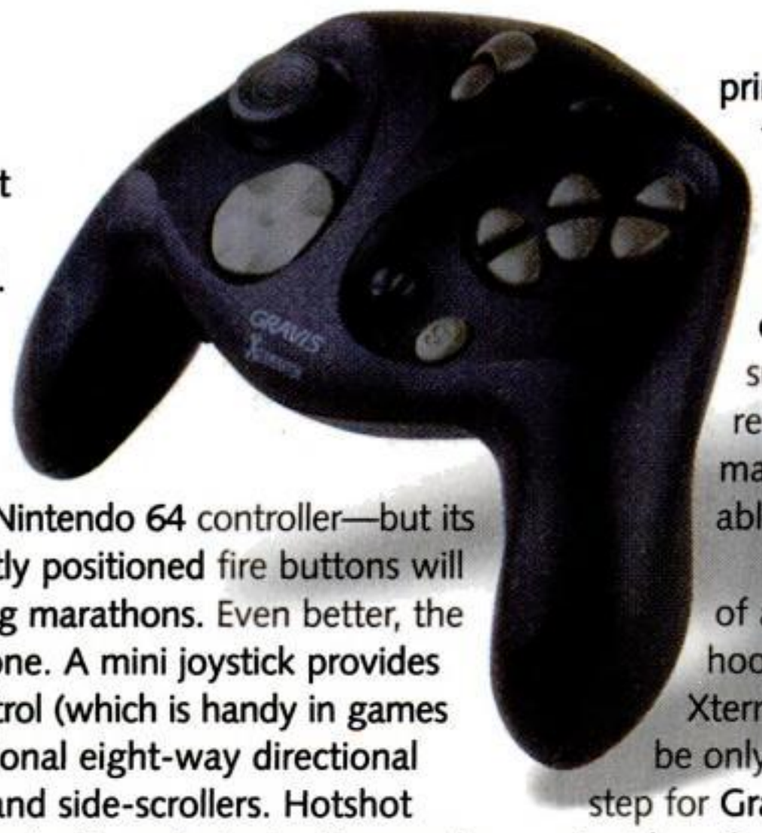
GAMEPADS

▶ Xterminator



The Xterminator is the most versatile and innovative controller we've ever used. It doesn't break any new ergonomic ground—imagine a cross between Microsoft's original SideWinder gamepad and a Nintendo 64 controller—but its elongated pontoon grips and perfectly positioned fire buttons will baby your tired fingers during gaming marathons. Even better, the Xterminator is actually two pads in one. A mini joystick provides proportional, continuous-motion control (which is handy in games that require steering), while a traditional eight-way directional pad assumes duties for sports sims and side-scrollers. Hotshot gamers will no doubt find ways to use both controls simultaneously.

The Xterminator also integrates an eight-way hatswitch, six primary fire buttons, a proportional sliding throttle for flight and driving games, two digital triggers, and two proportional, continuous-motion flippers (pinball anyone?). To top it off, the whole shebang is programmable except for the proportional D-pad. Buttons can be multistepped and multilayered, with each button supporting up to 19 keystrokes for button press *and* release. The programming interface is in-depth and only marginally daunting. Unfortunately, the manual is available in electronic form only.

With its deadly accurate control and dizzying array of analog and digital features (including a two-player hook-up), the Xterminator may be only one small step for Gravis, but a giant leap for gamers.

—BDR

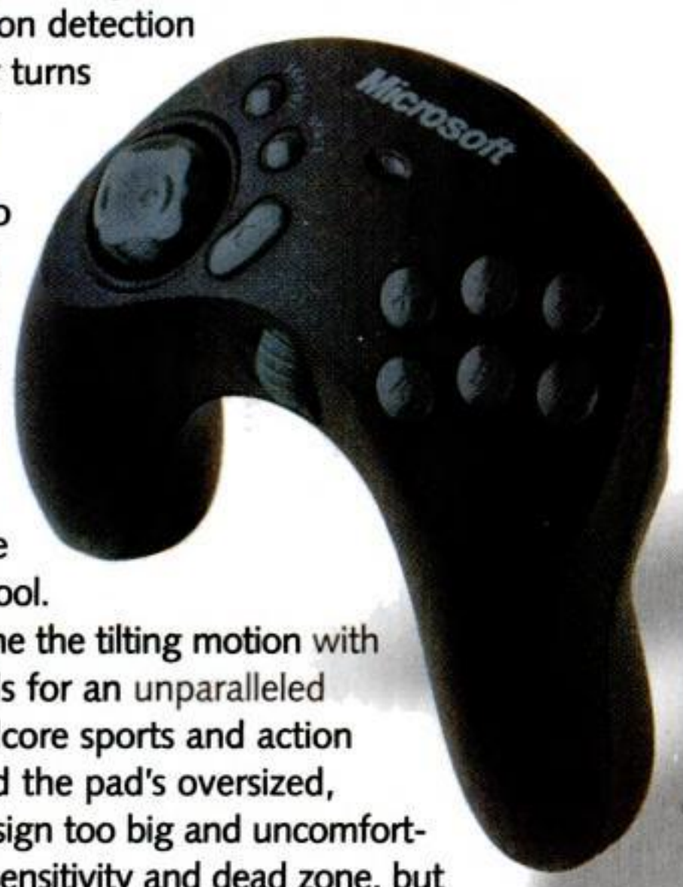
MAXIMUM PC VERDICT

Price $50
Company Gravis
Phone 800.865.2283
URL www.gravis.com

10

▶ SideWinder Freestyle Pro

The Freestyle Pro sports a solid-state, gravity-based motion detector that turns what would probably be a very ordinary gamepad into a freewheeling device fit for Elroy Jetson. With motion detection turned on, you can control game action by simply tilting the pad left and right to roll, and forward and back to pitch. With motion detection turned off, the controller turns into a traditional D-pad-driven gamepad. And because the Freestyle Pro resembles a pair of thick handlebars, the pad is a natural choice for racing games (the bundle includes a full copy of *Motocross Madness*!).



There's no denying the motion detection is très cool. But while you can combine the tilting motion with traditional D-pad controls for an unparalleled gaming experience, hardcore sports and action gamers will probably find the pad's oversized, forward-tilt handlebar design too big and uncomfortable. You can adjust the sensitivity and dead zone, but you'll experience some arm and hand fatigue if you drive for prolonged periods. The Freestyle Pro includes six fire buttons, two underside triggers, and a start key, all of which can be programmed for up to 32 keystrokes each. An oversized shift key allows for a second level of commands. The pad includes a continuous throttle wheel, but it lacks a center detent, which will infuriate purists. Unlike Microsoft's original SideWinder gamepad, the Freestyle Pro does not include a multiplayer hook-up.

—BDR

MAXIMUM PC VERDICT

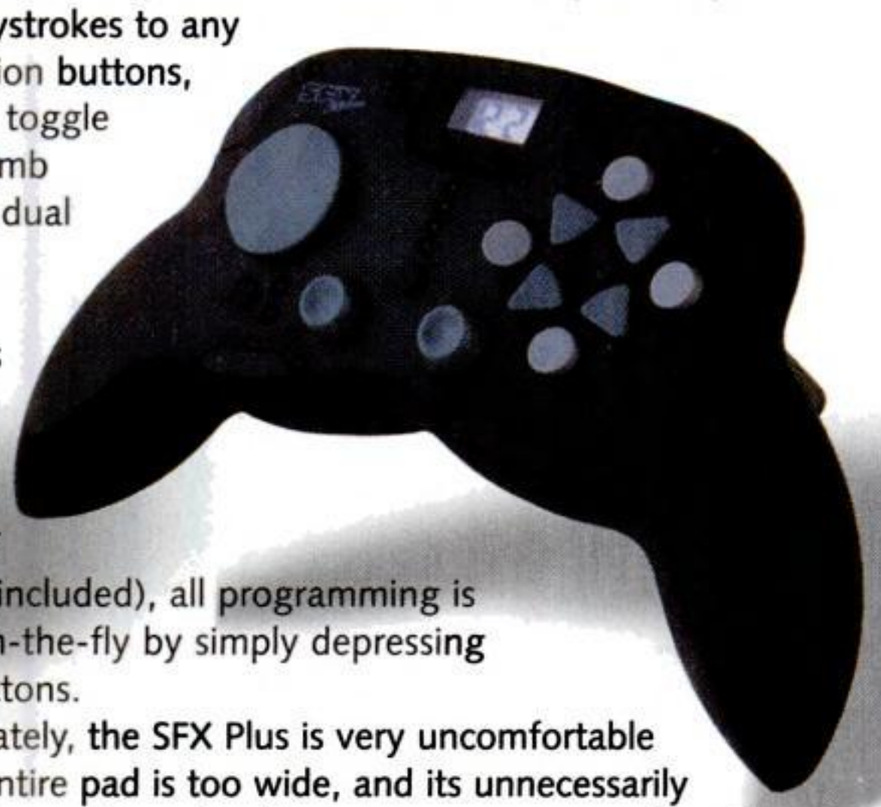
Price $70
Company Microsoft
Phone 425.882.8080
URL www.microsoft.com

8

▶ SFX Plus

At its worst, the SFX Plus is a run-of-the-mill analog controller with no multiplayer support or digital interface. At its best, the SFX Plus is a programmer's paradise that stores up to 480 distinctive game commands.

The SFX Plus operates in two modes: as a rudimentary gamepad, and as a keyboard emulator that lets you assign up to five keystrokes to any of the 24 action buttons, including the toggle switches, thumb buttons, and dual hatswitches. Because the SFX Plus uses a keyboard pass-through (PS/2 and AT adapters are included), all programming is completed on-the-fly by simply depressing keyboard buttons.



Unfortunately, the SFX Plus is very uncomfortable to use. The entire pad is too wide, and its unnecessarily pointed pontoon grips put undue pressure on your palms. And since the bottom triggers are spaced so far apart, you'll end up using the joints in your index fingers (instead of your fingertips) to perform simple button presses. Performance was middling, too. We experienced skittishness in the corners of the D-Pad and minor lag in button-driven keystroke executions.

Finally, the SFX Plus includes an embedded LCD alarm clock, a frivolous, throw-away gimmick. Maybe it's supposed to tell you to quit playing before your hands get tired.

—BDR

MAXIMUM PC VERDICT

Price $50
Company Suncom
Phone 847.229.0002
URL www.suncominc.com

5

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WHEELS

▶ SideWinder Force-Feedback

Microsoft's top-of-the-line 10-inch wheel is a design marvel, sporting ergo-grooves and a rubberized coating at the appropriate grip points. Multiple buttons—including dual F1-style shifting buttons—adorn the steering mechanism, while a 16-bit, 25MHz processor and high-torque motor control force-feedback bumps and thumps. An ABS plastic bolt/clamp combo secures the wheel to your desk. Gas and brake pedals sit on a weighted floor base.

Under a barrage of driving games, we found that Microsoft *can* bring the arcade driving experience to the home. The software-adjustable tension works great, and all those bumps, skids, and crashes in driving games translate into punishing jiggles and wiggles. But be forewarned: The force-feedback effects take some getting used to—the constant fight for control initially forces you to overcompensate in turns, causing major spinouts. Unfortunately, the pedal's base slides on carpeted floors and tilts forward unless both feet are resting on the base.

Despite the small design errors and hefty price, driving enthusiasts should take the SideWinder out for a spin. The package comes with the latest SideWinder software, as well as full force-feedback versions of Microsoft's *CART Precision Racing* and *Monster Truck Madness II*.

—*AS*

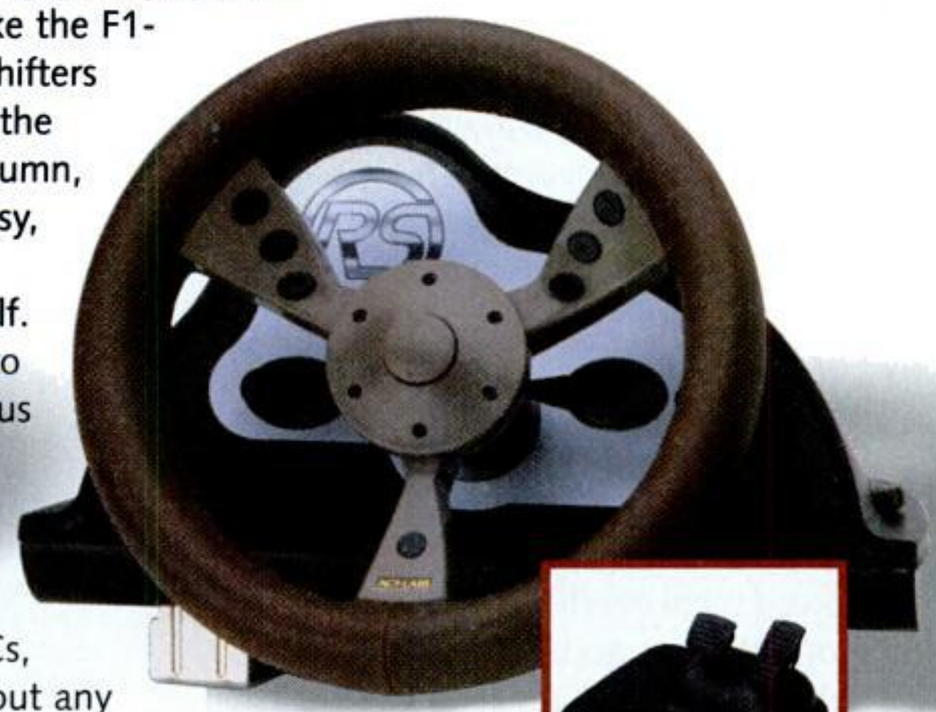
MAXIMUM PC VERDICT

Price $200
Company Microsoft
Phone 425.882.8080
URL www.microsoft.com

8

▶ RS PC Racing System

This wheel/pedal combo from Act Labs is packed with promise but stumbles in key areas. The 10.5-inch wheel offers tight tension for a high-performance steering experience—but the wheel's huge base consumes too much desk space. The wheel also features a four-way center D-pad—but it's pretty much useless during gameplay. And while we like the F1-style gear shifters that jut off the steering column, they're flimsy, as is the column itself.



Thanks to the ingenious RS Engine cartridge, the wheel supports not only PCs, but just about any old console gaming system. Installation is smooth, and once you clamp down the wheel and calibrate, you're ready to roll—in theory. Most dedicated video game consoles aren't anywhere near a desk, so you'll probably end up plopping this behemoth on your lap. Yikes. The pedal base, however, is wide enough to keep from tipping and doesn't slide as much as Microsoft's offering.

The RS PC Racing System gets the job done and in many ways proves that you don't need force-feedback to enjoy a thrill ride. Just make sure you can forgive its nagging design problems.

—*AS*

MAXIMUM PC VERDICT

Price $60
Company Act Labs
Phone 800.980.9997
URL www.actlab.com

7

Analog vs. Digital

The terms analog and digital get bandied about like nobody's business, but what do they mean in the realm of game controllers? It all depends on whether you're talking about a device's control method or its core technology.

Let's start with control methods. Analog control facilitates incremental, proportional movement: The further you move the joystick or the harder you press a button, the more impact you make. Analog control is mandatory for games that require finesse and precision manipulation, such as flight and driving sims. Conversely, digital control is nonincremental: Instead of a range of motion, you have two modes—on and off. Digital control is good for sports sims, and games that demand specific button-tap combos.

A device's core technology, be it digital or analog, has no bearing on movement properties. Rather, the core technology defines everything from the breadth of a controller's button set to how much processing power it demands from the CPU.

Analog devices consume almost 15% of available CPU cycles and are spec'd to support only two axes and four buttons. The analog interface also discourages multiplayer gaming. You can hook up two analog joysticks using a splitter cable, but each joystick can have only two active fire buttons.

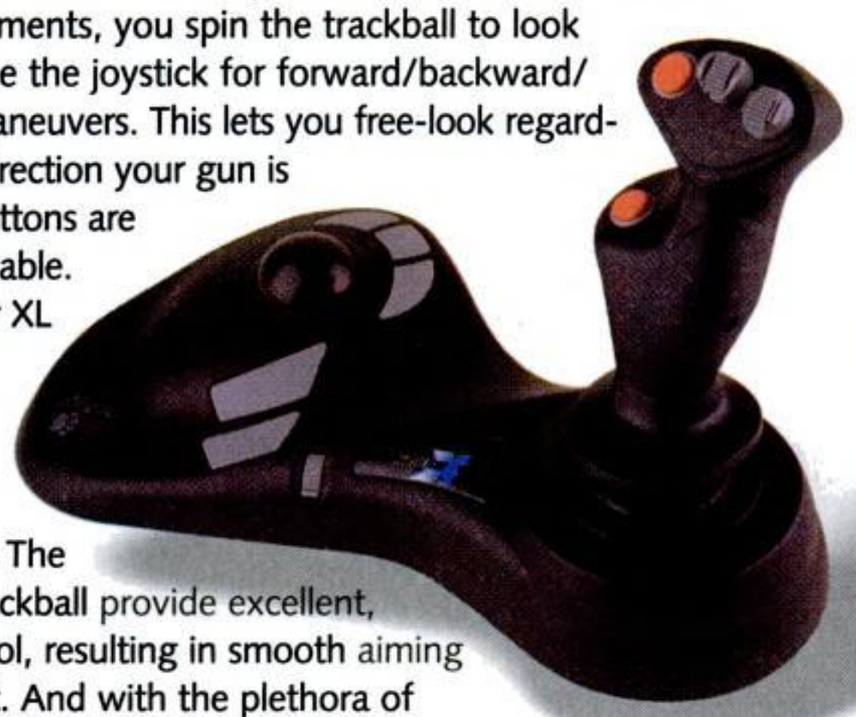
The majority of good sticks and gamepads are digital devices. These controllers offer reduced joystick drift (eliminating the need for calibration), button programmability, more accurate control, multiplayer connections for up to four players, and support for six axes and 32 buttons. Many new digital controllers also include onboard processors to help offload complex operations from the CPU. Digital devices can offer simultaneous analog and digital control, which means you don't have to give up continuous motion control when you need it the most.

SPECIALTY CONTROLLERS

▶ Panther XL

This odd-ball controller is targeted at first-person shooter fanatics who want to ditch their mice and keyboards. A five-button trackball awaits your left hand, while a joystick festooned with buttons and twin hat switches serves your right hand. A mini-throttle is thrown in for kicks.

The five-button/trackball combo is contoured for comfort, while the joystick's throw is responsive and thick. Within first-person environments, you spin the trackball to look around, and use the joystick for forward/backward/side-strafing maneuvers. This lets you free-look regardless of which direction your gun is pointing. All buttons are fully programmable.



The Panther XL takes time to master, especially if you're a mouse/keyboard monkey. The joystick and trackball provide excellent, jitter-free control, resulting in smooth aiming and movement. And with the plethora of buttons available, weapon changing and secondary weapon usage is all within fingertip reach. After running and gunning for a few hours, we started getting into the Panther XL's groove.

To enjoy maximum trackball/joystick pleasure, your game must directly support the Panther (Mad Catz keeps a list of compatible games on its web site; 23 games, including *Unreal*, *Quake II*, *Jedi Knight*, and *Half-Life*, are onboard). We can't recommended the Panther for flight sims or sports games, but for games that support the device, this is one smooth controller. Its success rests in the hands of game developers willing to code for it.

—*AS*

MAXIMUM PC VERDICT

Price $65
Company Mad Catz
Phone 800.831.1442
URL www.madcatz.com

8

▶ Air Racer AR-500

This little Batarang look-alike is a steering wheel/flight yoke combo that uses optical motion-sensor technology to convey X- and Y-axis position. You hold the Air Racer in front of you, and turn and tilt the device to control your virtual car or plane. The good news: The AR-500 doesn't take up any desktop space. The bad news: You'll feel like a dork using it.

The Air Racer comes with an array of controls: six thumb buttons on the right handle, and a directional pad/hatswitch and five more buttons on the left handle. Three bigger buttons in the middle of the controller set turbo and function modes. Steering wheel mode allows only X-axis movement (plug in a dedicated pedal for gas and brakes). Flight yoke mode allows full X- and Y-axis control.

While its concept must have sounded grand on paper, the Air Racer is more trouble than it's worth. Racing games suffer from a definite lag, forcing you to over-compensate in turns. Flight sims also suffer from a lack of instant, spot-on control. When a device actually helps you lose games, you know you need proven technology—anything but the Air Racer AR-500. It's nothing more than a hokey gimmick designed to pluck hard-earned cash from neophyte PC gamers.

—*AS*

MAXIMUM PC VERDICT

Price $60
Company SC&T
Phone 602.368.9490
URL www.platinumsound.com

2

Controller Terms

continuous-motion control Continuous-motion control (a.k.a. proportional control) offers gradual, precise movement along a particular axis. This is the preferred control method for flight sims and driving games: Instead of being limited to the eight rudimentary directions offered by a digital D-pad, you can use slight nudges to hit each degree of a 360-degree sweep. Rudimentary digital D-pad control is effective in, say, baseball sims when you need to choose a specific base on the diamond, or in fighting games, when you need to use a specific D-pad direction in an elaborate attack sequence.

dead zone An area on a controller—usually a radius near the center of the stick—where movement doesn't affect gameplay. Dead zones can be programmed by the user or hard-coded by the manufacturer. The dead zone is an important feature for flight and driving sims.

DirectInput A universal controller API for Windows 95/98, it allows up to 16 analog/digital controllers to be designated and defined, with each device supporting up to six degrees of freedom, 32 buttons, and a hatswitch.

F1 shift buttons In a Formula 1 racing car, gear shifting is executed by hitting twin pull pedals—one for upshifting and one for downshifting—located just behind the steering wheel. This allows the driver to keep both hands on the wheel at all times.

force-feedback A controller technology that translates physical events in a game into real-world tension, motion, and vibration. For example, in a war game, when your tank gets hit by artillery, your joystick shakes violently. Or in a driving game, the tension on the wheel feels like tires gripping the road—until you spin out and fly through the air, at which point the wheel suddenly becomes loose and bucks wildly. Force-feedback controllers use specially calibrated internal motors and require specially coded gaming software.

hat switch A special button, sometimes programmable, that allows for either an eight-way or four-way view in flight games. Push the hatswitch forward, and you'll look out the front of the plane. Pull the hatswitch back, and you'll look out the back of the plane.

X-axis The horizontal movement plane.

Y-axis The vertical movement plane.

Z-axis The twist movement plane; generally used for rudder control in flight games.

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Us and Zen

In your premiere issue, the Dream Machine included the Kenwood Zen 40x CD-ROM drive by HiVal, so I bought it. It works great except it behaves oddly when the the Maximum CD is first inserted. I can get the directory structure while it's initializing, but it fails shortly after that. I have tried the CD in other CD-ROM drives and it works fine, so what's the problem between Zen and the September CD?

—Brad George

Some motherboards have problems recognizing the Zen drive properly in BIOS and give Windows fits when it comes to reading certain types of media. Also, poor-quality cables longer than 18 inches don't keep out enough signal noise to allow the drive to function at its full performance potential. This can be fixed with either a shorter IDE ribbon cable or an Ultra DMA ribbon cable such as the one from Circuit Assembly (**www.ultracable.com**). This special cable contains twice the conducting lines of a normal 40-pin cable, improving the grounding and crosstalk characteristics inherent in high-speed IDE transmissions. Even though it's built specifically for Ultra DMA hard drives, it works with any IDE device.

Modem Hot Flashes

I have a Boca 56K Multimedia Modem that worked fine when I bought it about a year ago, then it started having periodic pauses. It isn't noticeable on the net, but is fatal when playing *Quake II*. I downloaded the latest drivers at the time, and that fixed the pauses. But I've never received a connection above 28.8K. The modem is new enough to be flash upgraded, so I installed the K56flex and V.90 drivers, but now I can't connect at all. I tried to dial into a friend's ISP (V.90) using V.90 and couldn't log on. I tried V.90 on my ISP and got 24K the first try, then never connected successfully again. The only way to log on is with older drivers. Am I going to need a new modem?

—Omega Man

It sounds like you're still running the stock K56flex firmware that has been superceded by V.90. You should upgrade to the latest V.90 flash available from Boca. It's odd that your modem doesn't fall back to a V.34 when you can't connect at V.90. It's possible the problems stem from you running the V.90 INF file without having the V.90 flash upgrade. Download the latest firmware from **www.bocaresearch.com/V90.htm**. Try logging on again.

If you can't log on, you may want to try US Robotics' V.90 test line. Open a Hyper Terminal session and dial 847.262.6000. A BBS style interface will ask you if your terminal supports graphics. Press the Enter key. Respond to the first name query with "line" and the last name question with "test." A series of tests will run, and you'll be given information on whether V.90 is supported. Full details on how to run this test are available at **www.3com.com/56k/need4_56k/linetest.html**.

SparQ Plugged

I recently installed a SyQuest SparQ 1.0GB removable hard drive in my Pentium 200 MMX. When I booted after installing the SparQ, I received a "blue" screen that said something like "cannot allow access to IDE drives due to bus-mastering, putting the drives in MS-DOS compatibility mode. A 16-bit device driver in your CONFIG.SYS or AUTOEXEC.BAT is causing the conflict."

I can't find any problematic drivers, such as SparQ DOS drivers, in my config or autoexec. Now my CD-ROM drive won't load and the hard drives are all in MS-DOS compatibility mode.

You see, I had just enabled BIOS PCI bus-mastering IDE support and the device-manager DMA mode support for my hard drive, SparQ, and CD-ROM. Is there anything wrong with doing this?

I know it gave me a warning saying "Some drives are incompatible with this mode," but I was sure my hard drive and SparQ drive could handle it, just maybe not the CD-ROM. Now I guess I've seen the consequences.

I have my drives set with the hard drive as primary master, the

I had just enabled BIOS PCI bus-mastering IDE support and the device manager DMA mode support for my hard drive, SparQ, and CD-ROM. Is there anything wrong with doing this?

This month THE DOCTOR looks at:

- **Notebook Overclocking**
- **Modem Firmware Upgrades**
- **Monster Sound Conflicts**
- **Slow RAM on a Fast Bus**
- **The Zen of Reading CDs**

and more...

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SparQ as primary slave, and the CD-ROM drive as secondary master.

—Haibei Li "waKKo"

The Doctor feels your pain and hopes you find comfort the following info: SparQ drives with firmware revisions SA_0032 or SA_0033 have problems with motherboards containing either a 1997 or 1998 release of the Phoenix BIOS. The problem rears its ugly head when DMA is enabled on the drive. The only solution is to turn DMA off. Of course, once you've run into this problem, you're forced to make all changes in Safe Mode, which may pose a few problems, since all settings made there aren't saved.

SyQuest offers a handy utility called "The SyQuest DMA Wizard" that will automatically disable DMA for all removable drives.

Also, you may run into a problem when putting the SparQ on the same ribbon as your hard drive, since this may slow down the hard drive. If you have the extra connections, you should separate them.

Monster Trouble

I installed a Diamond Monster Sound M80 in my Windows 98 PC. I had all the drivers and hardware installed, and everything was working fine, until I installed the audio utilities and Sound Blaster Emulation. Now my primary and secondary IDE controllers have little yellow exclamation points in front of them in the Device Manager. The device status says "This device is either not present, not working properly, or does not have all the drivers installed. (Code 10.) Try upgrading the device drivers for this device." Then I hit Update Driver and it won't let me update. It searches, finds the old drivers, and says it will use those. Nothing is fixed.

I don't have a motherboard manual, so I don't know what brand it is. I do know that it has the Intel 443LX chipset since it's listed in Device Manager.

The CD-ROM drive doesn't work either. I mean it works, but not well. I couldn't install a game from it. I could browse a CD and get up to the installation point, but it wouldn't start the installation itself. Please help me.

—Nick Benson

It sounds like the Monster Sound M80 has stomped on the IRQs or memory address for your IDE controller, although that's odd because the Sound Blaster Emulation should occupy only IRQ 5. It's also odd that your CD-ROM is working, sort of. You should download the latest drivers from Diamond Multimedia (**www.diamondmm.com**). Uninstall your older Monster Sound drivers and install the new Monster Sound drivers, then reboot.

If you're still experiencing a conflict with your IDE controllers, try to find exactly what is conflicting by clicking on the resources tab of the device manager after selecting a problem device. You may want to try removing the IDE controllers in device manager and rebooting to see if Windows will automatically resolve the conflict as well. It sounds like you're out of resources, so you may just have to chuck that Sound Blaster legacy support.

Take the RAM with You

I'm considering replacing my aging Asus P2L97 motherboard with a shiny new BX-based board. I have 256MB of "legacy" 66MHz SDRAM right now, and I really, really don't want to spend any more cash.

Would the RAM hold at 100MHz? Would my PII 266 handle that speed as well? I've got it running at an 83MHz bus and the system's been rock solid.

—Richard Trska

While your memory seems sound, you may want to check whether your current RAM has a Serial Presence Detection chip. This little chip works with the BIOS on the BX motherboard to set correct memory speeds, and without it your system won't boot, even though the RAM may physically fit in the DIMM sockets. The only real way to test your RAM is to plug them into a 440BX system and see if the system works.

Speed-wise, the same thing applies. You'll just have to test your RAM before making that commitment. With regard to your 266MHz CPU holding, you should be able to bump it up to a 100MHz bus speed with nary a problem. Some applications may not dig overclocking, so proceed with caution. ✹

Overclocking CPU speeds on a notebook computer is not recommended. Changes in clock speed will result in unstable operation and even total system failure.

Overclocker's Corner

Overclocking the System Bus

Is it possible to overclock a Pentium 233 at 75MHz on an FIC PA-2006? The jumpers only have a multiple of 3x. FIC claims the jumpers could be set to 1.5 and the BIOS would recognize a Pentium 233 (if the bus is set to 66MHz). Is this possible?

—Andrew M. Bremer

You have a motherboard with a 430TX core-logic chipset. If the multiplier is set to 1.5x, the chipset automatically checks the CPU. If it detects a 233MHz CPU, it sets it accordingly, but only when the bus speed is set to 66MHz. If you set it to 75MHz, it uses a 1.5x multiplier and sets the speed of the CPU to 150MHz. Your best bet is to use the 3.0x multiplier with a 75MHz system bus, giving you a total CPU speed of 225MHz. The loss of 8MHz for a 75MHz bus is well worth the trade-off.

As always, The Doctor recommends that you use protection. A heatsink and fan combo are best, with additional fans in the case (blowing directly at the CPU) are highly recommended. If you start noticing funny behavior, put it back to 66MHz.

Faster Notebooks

I currently own a Toshiba Satellite Pro 460 CDX notebook, and I would like to know if this thing is overclockable. It is a Pentium 166 MMX. If it is overclockable, is it safe for the machine, since there is only one fan. And, finally, how would I go about doing it?

—Derek Visslailli

Overclocking the CPU on a notebook is not recommended. Portable motherboard designs are engineered with specific CPU clock speeds in mind. Changes in clock speed will result in unstable operation and even total system failure.

Today's smaller and lighter notebook designs incorporate more components in compact areas, resulting in thermal buildup. An overclocked CPU will generate more heat than the notebook was designed to dissipate, resulting in component damage, motherboard layer separation, CPU mounting failure, or chassis damage. ✹

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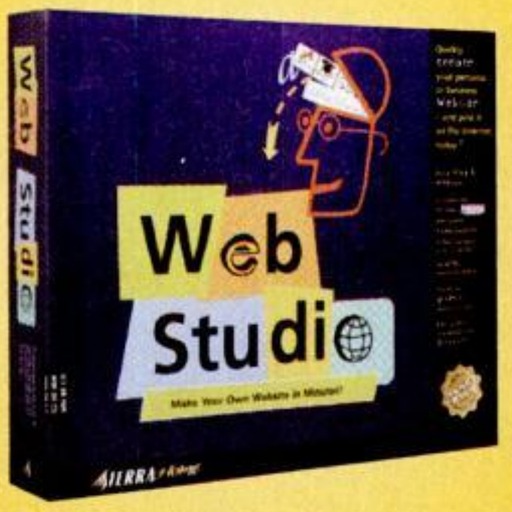

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- Genesis 82
- Sven's MRG 82
- Katmai 85

The Genesis Engine

A free 3D engine to build your games

Game and technology developer **Dave Stafford** *has created a new 3D engine that his 30-person company, Eclipse, is giving away for free. There's no catch. Anyone can go to Eclipse's web site, www.genesis3d.com, and download beta-2 right now and start coding.*

Alpha-blended coronas and transparencies are featured here, with a character taking ambient light.

MAXIMUM PC If Genesis is so great, why give it away?

STAFFORD Getting it in the hands of thousands of people is the fastest, most efficient way to mature the technology. It's shortsighted to squeeze a few dollars from a handful of customers. I'll build the best technology by having thousands of people bang on it, write tools for it, and build apps that push it beyond its limits and make it do things it was never designed to do.

I hope other 3D engines will follow my lead in giving away their technology.

MPC What's the basis of the engine?

STAFFORD We use a BSP for world ordering and collision tests. Essentially, your basic ray intersection primitive becomes a gating item. How much realtime lighting can you do? Can you make a physics subsystem handle collisions fast enough to run in realtime? It's hard to beat a BSP for that. Even if we go on to other representations for world geometry, we'll likely keep a BSP around for just this.

MPC Don't the Quake II and Unreal engines do most of what you're touting?

Sven Technologies' MRG

Giving you more 3D characters than ever before

Sven Technologies has a new way to throw more polygons on the screen without a performance hit. Sven's new Multi-Resolution Geometry (MRG) technology reduces the polygon count of a game character on slower computers. It also recognizes depth of field, so when characters are in the background, it draws fewer polygons.

We spoke with **Saul Kato**, *president and founder of Sven Technologies.*

The wireframe and texture-mapped heads illustrate how a character's polygons might be reduced as the character recedes in the distance.

MPC Why is MRG an important developer tool?

KATO Level of detail (LOD) is virtually a requirement for scalable, high-performance 3D games. A continuous level of detail system achieves this without a loss in visual quality. Even when we can draw a trillion triangles a second, we'll still need a technology that allows highly detailed objects in the near field that lose detail in the far field in order to have both high performance and high visual quality. It's loosely like mip-mapping for polygons.

MPC How does MRG work?

KATO It preprocesses texture-mapped, animatable polygon meshes into a scalable format, then "plays back" the mesh at any polygon count in a dynamic 3D scene in hardware or software rendering. Far objects are drawn with few polys; objects near the camera are drawn with high poly counts. 3D games should speed up three or four times with MRG.

MPC Aside from higher framerates, what other benefits does MRG bring to developers?

SAUL MRG allows automatic tuning to client machine performance, higher per-object polygon allowances, zero object popping, no

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com

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STAFFORD We have skeletal models with a dynamic attachment of a soft-skin per frame. It really isn't much more CPU intensive than vertex-based animation. It is more complex to create, but it's so much more powerful that it's a safe prediction everyone will be doing it in the next generation of 3D engines. The advantages are many. We can create motions with a combination of hand-animation, motion-capture, and inverse kinematics, which can be intelligently blended together. For example, you can have two keyframes of an archer: one with the bow pointing down and one with the bow pointing up. The engine generates any in-between frames by assigning different weights to these keyframes and smoothly blending between them. Another cool thing is that the animations and blending are separate from the characters themselves, so you can create a library of motions and share it across a variety of characters that share the same bone structure.

A bridge sways and deforms from a character jumping on it

We're also proud of our physics subsystem. You can build objects in the editor, specify how their joints connect, what their physical properties are, then set them loose in the 3D world and see how they behave.

MPC What 3D APIs are you supporting?

STAFFORD We support Direct3D, Glide, and our proprietary software rasterizer. OpenGL support is still undecided. DirectX 6 looks very good, and if OpenGL offers no advantage, then we won't port it to OpenGL.

The most compelling feature of DX6, for me, is multitexture support.

Radiosity lighting softens the scene and makes it look more natural.

Glide and OpenGL have had this for a while now. We've experimented with bump-mapping, but the hardware to do it justice really isn't widely available yet, so we'll wait and see where it goes.

PRODUCT AVAILABLE

Price Free
Company Eclipse Entertainment
Phone 512.206.0130
URL www.genesis3d.com

NOW

number-of-character limitations, and streaming 3D.

MPC How is it implemented?

KATO It's implemented as two APIs: a high-performance, compact, runtime API called MRGPlay for managing MRG structure and generating variable polygon objects on the fly, and a substantial, full-featured, offline API called MRGAuthor for building preprocessing capability into the developer's authoring pipeline.

MPC Is the API implemented at the developer level, or does it plug into DirectX?

KATO It's one step above the low-level rendering API. It works on top of DirectX, OpenGL, Glide, or proprietary software renderers. We provide reference implementations and sample code for the three major APIs.

We also spoke with an anonymous game developer who has licensed the technology. The developer asked us not to mention him or his project by name, because this technology provides a competitive edge. It will be a AAA title coming out in mid-1999.

MPC You're one of the first developers to license MRG. Can you discuss your project and what drew you to the technology?

DEVELOPER We're creating a first-person 3D action game. We were drawn to the technology because it allows us put more enemies on screen.

MPC What other technologies did you evaluate?

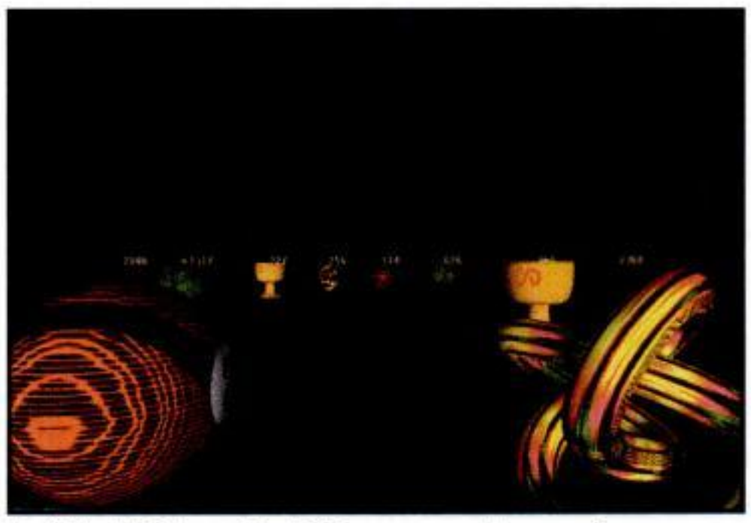
DEVELOPER None. MRG was the first we evaluated. It did what we needed it to and was an easy drop in to our code, so we went with it.

MPC Are you using MRG to improve framerates or to throw more characters on the screen?

DEVELOPER Both. In essence, the framerates are boosted by the fact that there are fewer polys to deal with. There are two ways to go. Keep the character count the same and bump the poly counts up, or keep the poly counts similar to today's games and have twice the guys on screen. We are going with a mixture. Some one-time characters will have a high count, while the grunts might be lower in count, so you can have seven or eight in view at a time.

MPC If you're using it to get more characters on the screen, how many are you able to throw at the screen at one time?

DEVELOPER We've effectively doubled what we were doing before with no real fps loss. You can also adjust things like the drop off curve for the LOD and get even more fps.


In this MRG-enabled 3D scene, poly counts are denoted by numbers above objects. Polygon counts scale with the object's distance to the camera.

Or you can hook the LOD to the fps and when things get slower, the game will automatically adjust the poly counts accordingly. It's all very flexible and scalable.

PRODUCT AVAILABLE

Price $20,000 per title
Company Sven Technologies
Phone 650.852.9242
URL www.sven-tech.com

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Katmai

Intel's new CPU instructions open a fast lane for 3D performance

Katmai is the code name for 70 new instructions that will be added to the existing Pentium II and Xeon CPU architectures. Some of the enhancements build on Intel's original MMX extensions, while others improve cache utilization (a boon for everything from MPEG-2 decoding to high-end workstation apps). But the main thrust behind Katmai is Single Instruction Multiple Data (SIMD) floating-point operations.

As Tom Halfhill explains on page 37, floating-point operations are integral to geometry transformations in 3D games, calculating how polygons are redrawn during the course of gameplay. The more floating-point power you have, the faster your polygons will fly. Katmai's SIMD allows the CPU to perform four 32-bit floating-point operations per SIMD pipeline—four calculations for the price of one instruction.

Sound familiar? AMD is already successfully pushing a SIMD scheme called 3DNow! in its K6-2 processor. 3DNow! executes two 32-bit floating-point operations per pipeline--two fewer operations per pipeline than Katmai. If Intel's new processors go with a dual-pipeline architecture like the one used by K6-2, their SIMD engines will offer twice the processing capacity of the AMD part. But if the Katmai CPUs launch with only one SIMD pipeline, they will essentially be equal in SIMD power to K6-2. Intel's intentions are vague; it's unclear whether the new processors themselves allow for two SIMD pipes.

Intel says Katmai instructions will appear in 450MHz and 500MHz "performance desktop" CPUs sometime in the first quarter of 1999. These processors will essentially be regular old Pentium IIs loaded with Katmai enhancements. They'll feature 512K of L2 cache running at half the core processor speed and be compatible with the existing 440BX core-logic chipset (so you can upgrade to a Katmai CPU without buying a new motherboard!). Later on, Intel will roll out Katmai in Xeon-level processors, and maybe even speed up the system buses for Katmai-enhanced CPUs to 133MHz (this would entail new core-logic chipsets).

Applications can realize Katmai benefits in two ways: They can be specifically coded to use the instructions, or simply run on Katmai-enhanced videocard drivers. Using both strategies results in the highest performance gains. Intel says it already has 500 independent vendors playing with the new instructions, and is confident they'll be warmly embraced by software and hardware folks alike. Imaging, video, and speech-recognition applications can benefit from the new instructions, but the 3DNow! roll-out tells us that game developers are the quickest to embrace multimedia enhancements.

It should be noted that Katmai is the most significant augmentation of the x86 architecture since 1985, introducing eight new registers to pull off the SIMD magic (registers are specific locations where the CPU stores data to be processed). The new registers demand a new processor mode, which in turn requires an operating system extension (Intel promises a Win98 patch, and says Katmai support will be native to NT5). On the plus side, the new processor mode allows the CPU to use SIMD floating-point simultaneously with normal floating-point and MMX, something 3DNow! can't do.

We expect to see a hands-on demonstration of Katmai technology at Intel's headquarters sometime in early December of 1998; our own benchmarking should follow in January. One can only guess at Katmai's impact on 3D performance, or even what the technology will be called (the Katmai code name will be 86'd—pun intended—and MMX2 has already been ruled out by Intel marketers). But it does seem likely that Katmai will eclipse the less powerful 3DNow!, and that AMD will be forced to integrate the x86 architecture extensions to keep pace with the juggernaut that is Intel's developers' program. In a worst-case scenario, future applications will look for Intel's new registers and refuse to run any code that doesn't recognize them.

—Jon Phillips

THE SPECS AT LAUNCH

ENHANCEMENTS
70 new multimedia instructions

CORE SPEED
450/500MHz

CACHE
512K (half core processor speed)

COMPATIBLE CHIPSET
440BX

Concurrent SIMD-FP Architecture Application Benefits

3D Geometry	More detail, more objects, true lighting, more effects
Physics	Realistic movement via inverse/forward kinematics, collision detection
High-end Audio	True AC3, audio/speech processing
Imaging	Perspective warping function (all intermediate variables are FP)

SIMD can aid a lot more than just 3D geometry. But when's the last time you used speech-recognition software or warped an image?

Perspective Warping Function

Perspective warping in image editing apps is usually done by integer operations—but SIMD floating-point is so much faster!

PRODUCT AVAILABLE

Price TBA
Company Intel
Phone 800.548.4725
URL www.intel.com

Q1.99

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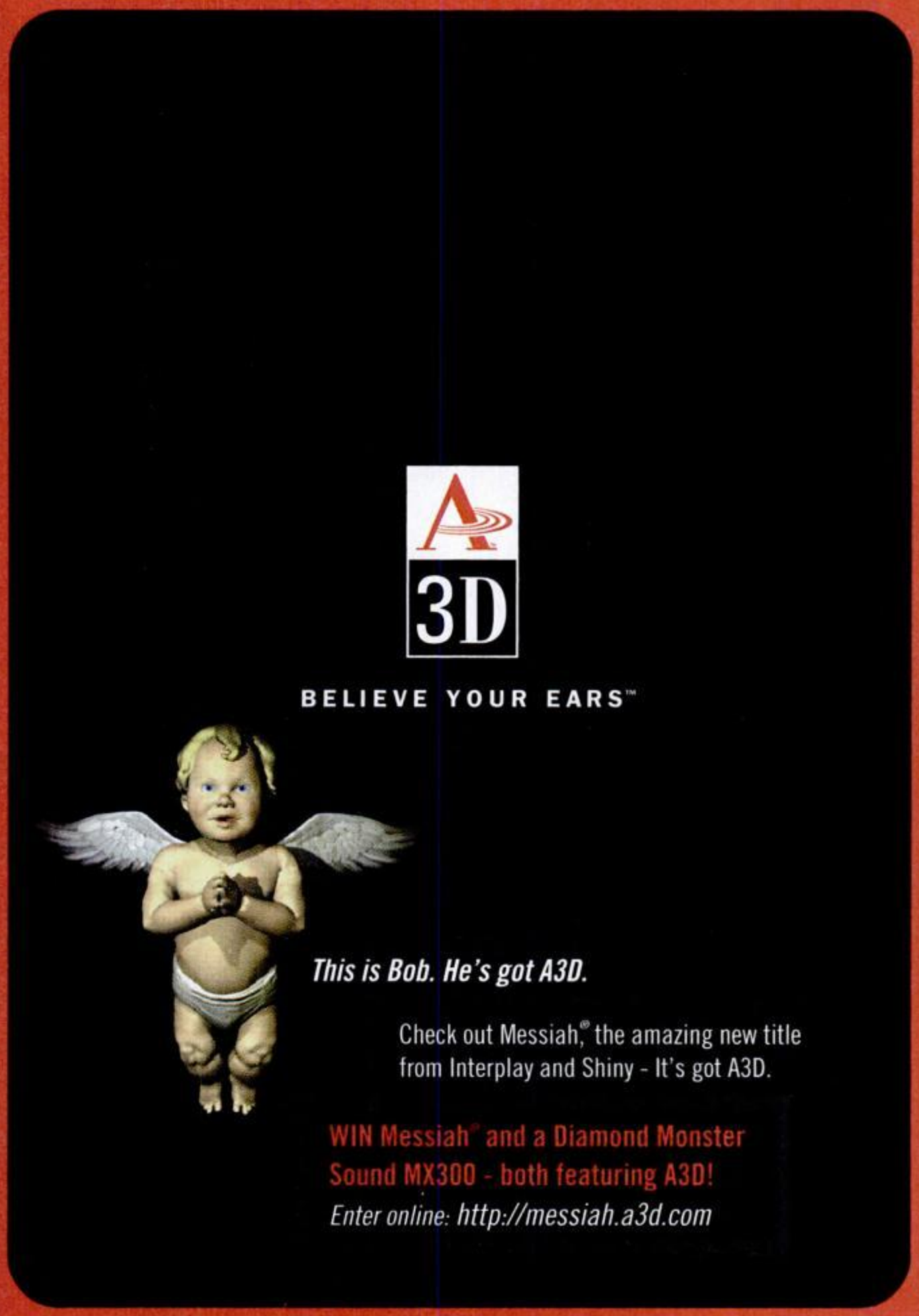
Wow! Audio for your computer that enables your ears to track sounds the way your eyes are tracking these words. Which means now if suddenly something goes Bang, you'll know just where to look. That's because A3D™ from Aureal actually puts audio into perspective - not by dividing it between speakers – by creating real sounds that work the way your ears do. It comes in handy when you need to Zap aliens lurking behind you. In Fact, game makers like Interplay and Shiny are featuring A3D in their newest titles. Experience A3D for yourself at www.A3D.com.


3D
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Check out Messiah,® the amazing new title from Interplay and Shiny - It's got A3D.
WIN Messiah® and a Diamond Monster Sound MX300 - both featuring A3D!
Enter online: http://messiah.a3d.com

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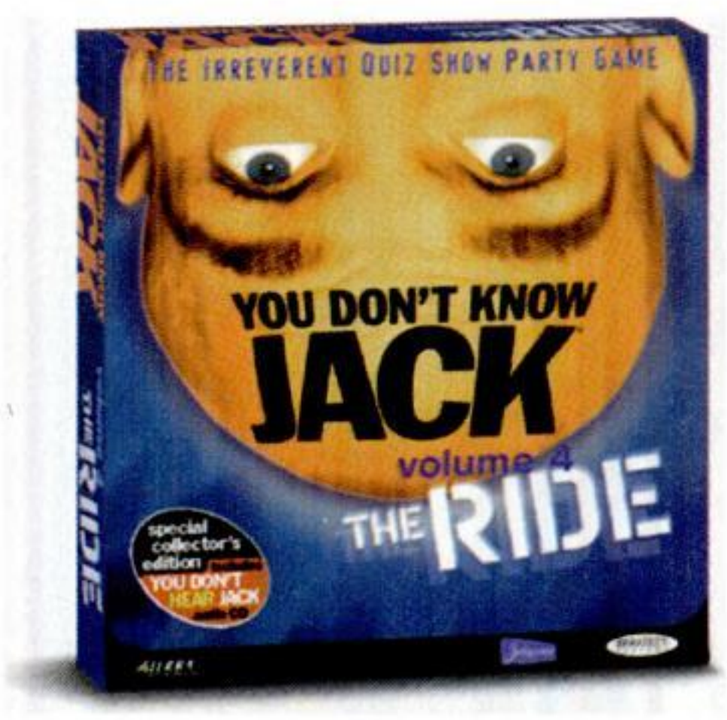
SAVE
$1.00

New "Niagara Strength" Adult Diapers provide the ultimate in adult protection -- for those times when you just can't hold it in!

This product has been found to be a helpful aid in the playing of the CD-ROM game YOU DON'T KNOW JACK® Yes folks, now you can laugh all you want. The patented self-activated Liqui-Guard™ system absorbs the unsightly mess, holding it comfortably away from your skin. And now, with our new triple-action heavy-duty reservoir receptacle, you'll stay dry up to 6 games of YDKJ longer than with the other leading brand. Actual results may vary. Do not use in conjunction with fancy upholstery. Use only as directed. By the way, if you're reading this you have way too much time on your hands.

0 00000 078520 2

A game this funny requires a certain degree of preparation.



Prepare to laugh hard. Really hard. The latest YOU DON'T KNOW JACK® mixes high culture with pop culture in a fast-paced, trouser-drenching CD-ROM game. It's JACK like never before. So be prepared to lose it. But be warned: appropriate attire is recommended.

The irreverent quiz show party game.

BERKELEY SYSTEMS

Jellyvision®

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Testing Policy ▶

Our product evaluation process is built on down-and-dirty, hands-on testing. All hardware benchmarking is conducted in the Maximum PC lab by Maximum PC editors, and, whenever possible, we use real-world applications to gauge performance. Our final verdicts are based on benchmark results and a subjective appraisal of product features.

Real-World Benchmarking

Our benchmarking charts are simple: The farther right the bar reaches, the better the hardware performed. Here's the deal on specific benchmarks.

▶ **CPU/MOTHERBOARD** Based on Symantec's System Information benchmark, the bootMark tests low level motherboard components.

▶ **WINDOWS APPS** BAPCO's SYSmark98 uses task scripts in popular productivity and content creation apps to test system performance. The Official Score is based how fast the system can complete all tasks.

▶ **HARD DRIVE**
HD Tach measures multi-threaded hard drive performance. We publish the average 16k read score in megabytes per second.

Other Benchmarking

▶ **OPENGL** *Quake II* tests the 3D accelerator (along with its OpenGL drivers) and the CPU's floating-point. Using demo2.dm2, final score is in average frames per second at 800x600.

▶ **CD-ROM**
CD Tach measures CD-ROM read times and CPU utilization. We publish the drive's cumulative speed rating (e.g., 24x).

▶ **3D RENDERING**
We use Newtek *Inspire3D* to render a complex ray-traced scene. Final score is in total seconds from start to finish.

▶ **DESKTOP PUBLISHING** In a scripted Adobe *Photoshop 5.0* test, we record how long it takes to apply various filters to a control image. Final score is in total seconds from start to finish.

▶ **DIRECT3D** *Forsaken* is a space shooter that tests the system's Direct3D accelerator. Final score is in average frames per second at 800x600.

EDITOR'S CHOICE AWARD:
Only 9 and 10 verdicts are even eligible for the coveted Kick Ass award, the mark of PC excellence.

KICKIN' THE TIRES ON THE LATEST HARDWARE AND TAKIN' THE LATEST SOFTWARE OUT FOR A SPIN

Hardware Photography by
AARON LAUER

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Gateway GX-450XL

Goodies galore—Xeon's a bore

Xeon power in an amazing consumer package. Indulge yourself and enjoy.

PLUSES
- You can brag about the 450MHz Xeon
- Expansive expansion possibilities
- Gobs of storage
- TV-tuner card

MINUSES
- The 450MHz Xeon doesn't boost performance
- Sub-par DVD playback

The GX-450XL is billed as the first "enthusiast" PC to feature Intel's server-driven 450MHz Pentium II Xeon processor.

Once you open up this case, your friends and co-workers will ooh and aah about the Xeon's sheer size, marvel at the stalactite-mounted heatsink, and cogitate on its funky wind-tunnel/fan combo. But then they'll want to know how much better it performs than the standard Pentium II. And since it really doesn't, you'll be at a loss for words.

The Xeon's main advantage is its full-speed L2 cache, running at the same speed as the processor core. (On regular Pentium IIs, the cache runs at half the clock speed.) For home users playing 3D-accelerated games or surfing the net, the benefits are negligible. In fact, compared to Dell's 450MHz Pentium II–powered XPS R450 (reviewed in the November 1998 issue), the GX-450XL performed only slightly better, averaging gains between 4% and 6% during our main system benchmarks. Not exactly the groundbreaking performance we were expecting, but excellent nonetheless.

The GX-450XL's motherboard supports dual Xeon processors, but sadly our test machine came with only one. A terminator card—which signals the PC that only one processor is installed—occupied the second slot. This termination enhances signal integrity and quality, but doesn't actually disable the second slot. The processor, terminator card, and heatsink are conjoined using a single plastic encasement. Adding a second processor requires the removal of the fan, wind tunnel, and a half dozen screws or so. But it really isn't worth the hassle (or the expense), because Windows 98 doesn't support symmetric multiprocessing.

Truth be told, we were more impressed by the other system components. Inside, you'll get six PCI slots (one shared), 10 drive bays (four 5.25-inch and six 3.5-inch), and four DIMM slots (a single 128MB DIMM is included). A 300-watt power supply provides ample juice, and with enough free space in the case to park one of those new Volkswagen Beetles, future expansion will not be a problem. Other niceties: IBM's always impressive 14GB EIDE hard drive, Toshiba's 4.8x max DVD-ROM drive, a PCI TV/FM tuner card, and a bonus: Philips' CD-ReWritable drive (6x read, 2x write). Phew!

If that weren't enough to make you sweat, the GX-450XL also includes an OEM version of STB's Velocity 4400 videocard with 16MB SDRAM, based on nVidia's impressive TNT 2D/3D chipset. Games looked positively stunning in both Direct3D and OpenGL. At 1024x768, *Quake II* dropped to the mid-30s.

The GX-450XL's DVD chores are handled by Mpact's MPEG-2 decoder card, a lame-brained idea, considering the company recently went out of business. Worse, the DVD playback looked awful, with tons of artifacts, shimmers, and pixelated images. Since Gateway uses software DVD on its other systems, it would've made more sense to ditch the card to free up a PCI slot or choose another hardware solution altogether. The inclusion of STB's TV/FM-tuner card is also dubious. We would've preferred a TNT card with TV out, saving another PCI slot.

There's no denying the GX-450XL is a powerful beast. But with a regular Pentium II, K6-2, or overclocked Celeron, it would be just as impressive.

—Bryan Del Rizzo

UNDER THE HOOD

THE BRAINS

CPU	Intel 450MHz Pentium II Xeon
L2 Cache	512K
RAM	128MB PC100 SDRAM (expandable to 2GB)
Motherboard	Intel Marlin Spike 440GX
Drive Bays	Six 3.5-inch (five internal free) and four 5.25-inch (two external free)
I/O Ports	Two PS/2, two USB, two serial, one parallel, gameport, audio-in and -out, RCA-out, S-Video-out, TV-in, FM-in

DISPLAY

Video	STB OEM Velocity 4400, 16MB SDRAM
Monitor	Gateway 19-inch VX900, .22 dot pitch
Res/Refresh	1600x1200@75Hz

STORAGE

Hard Drive	IBM DTTA-371440 14.4GB, 7,200RPM, Ultra DMA IDE
CD/DVD	Toshiba SD-M1202 4.8x DVD-ROM
Removable	Phillips CDD 3610 6x2 CD-RW
Fax/Modem	56K ISA Modem

SOUND

Sound	Creative Labs Sound Blaster Audio PCI
Speakers	Boston Acoustics Digital Media Theater with Dolby Pro Logic Surround

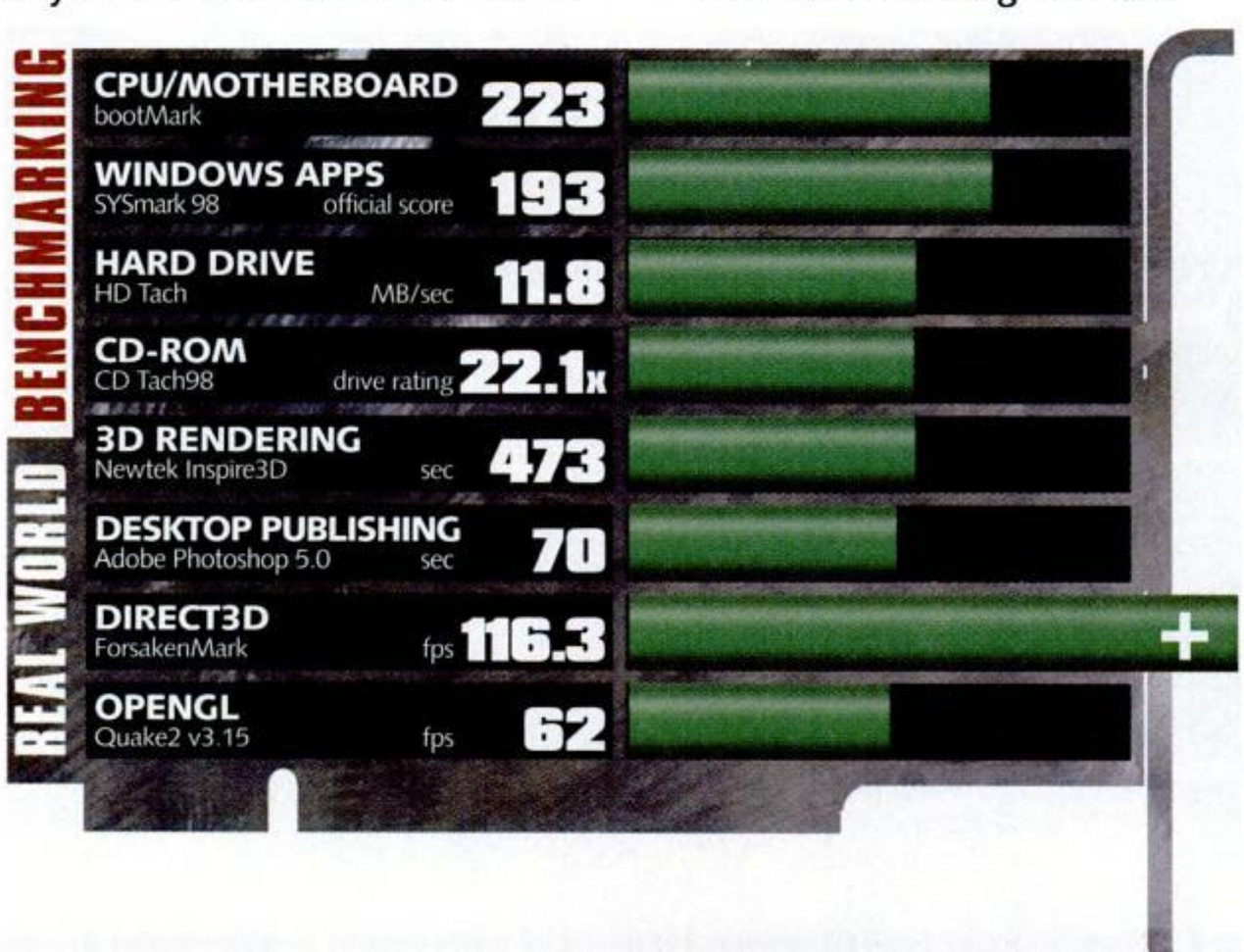
OTHER

STB PCI TV/FM-tuner card | Internet-ready keyboard

THE BUNDLE

Windows 98 | Home Essentials | choice of bundles

BOOT 1:02 DOWN 0:35



MAXIMUM PC VERDICT

Price $3,999
Company Gateway
Phone 800.846.2000
URL www.gateway.com

9

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EXPANSION NOTES

This case has more square footage than the average apartment in San Francisco. Rent out the space for one month and you'd have this computer paid off in no time! But with the seven extra dive bays and two PCI slots, future expansion is guaranteed.

EXPANSION MAP

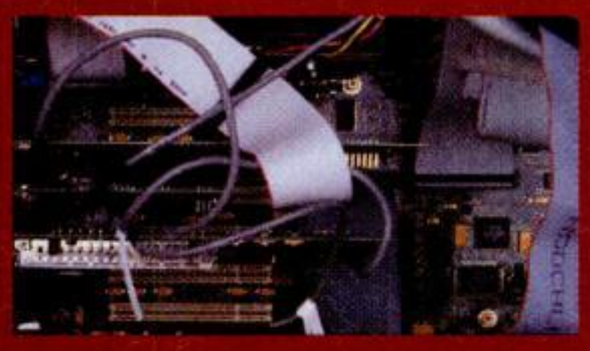
AGP	2D/3D video
PCI	Free
PCI	MPEG decoder
PCI	Soundcard
PCI	TV/FM-tuner
PCI	Free
PCI/ISA	Modem

IROS

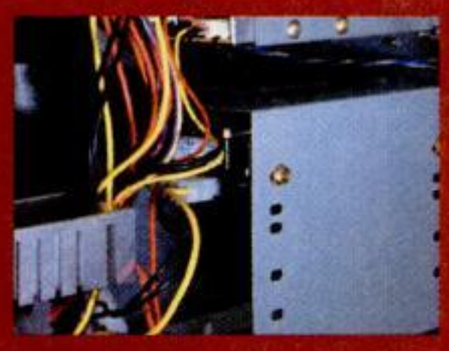
00 System Timer	**08** System Clock
01 Keyboard	**09** USB
02 Interrupt Controller	**10** MPEG decoder
03 Modem	**11** Video
04 COM 1 Port	**12** PS/2 Mouse
05 IRQ holder	**13** Num data proc
06 Floppy Port	**14** PCI bus-master
07 Printer Port	**15** Secondary IDE

DMAS

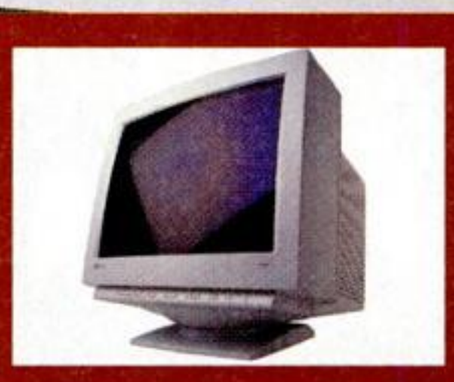
02 Floppy	**04** DMA Controller



Xeon Power Activate! When choosing between Pentium II and Pentium II Xeon, evaluate the system, not the processor. Intel plans to integrate Katmai into future Slot 1 (Pentium II) and Slot 2 (Pentium II Xeon, codenamed Tanner) roadmaps.



Thar She Blows With all of these cooling (and cool) tools, there's no risk of things getting too hot while the case is tightly closed. But if you're like us, you'll leave the case open for the wow factor.



The Shadow Knows The GX-450XL also includes Gateway's 19-inch VX900 monitor. It's big enough and has a nice .22 dot pitch, but it's not aperture grille and leaves a bit to be desired.

Crank It Up These Boston Acoustics digital MediaTheater speakers—consisting of four satellites and a subwoofer—deliver Dolby Pro Logic sound and will force your neighbors to use earplugs.

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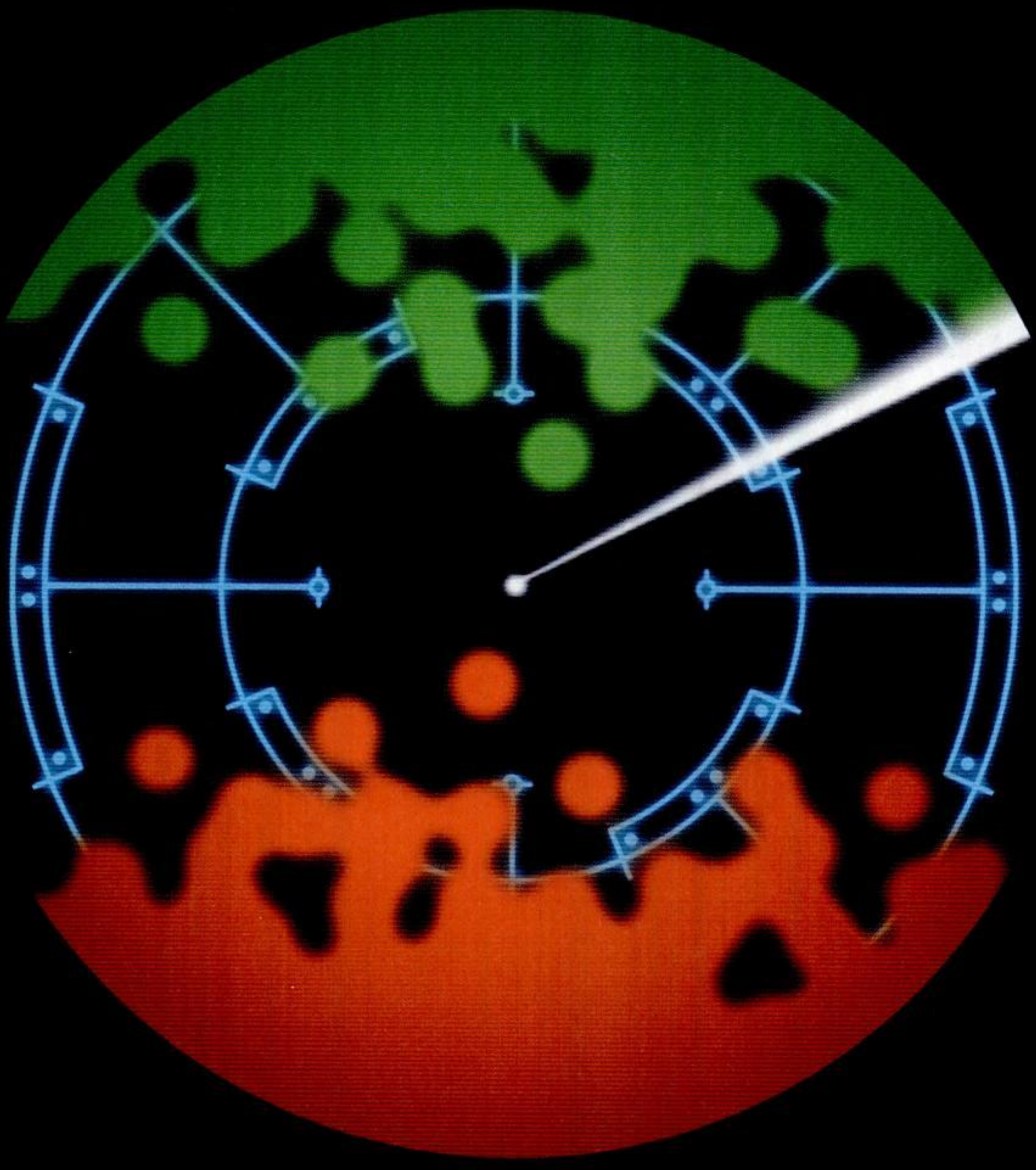

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FOX INTERACTIVE

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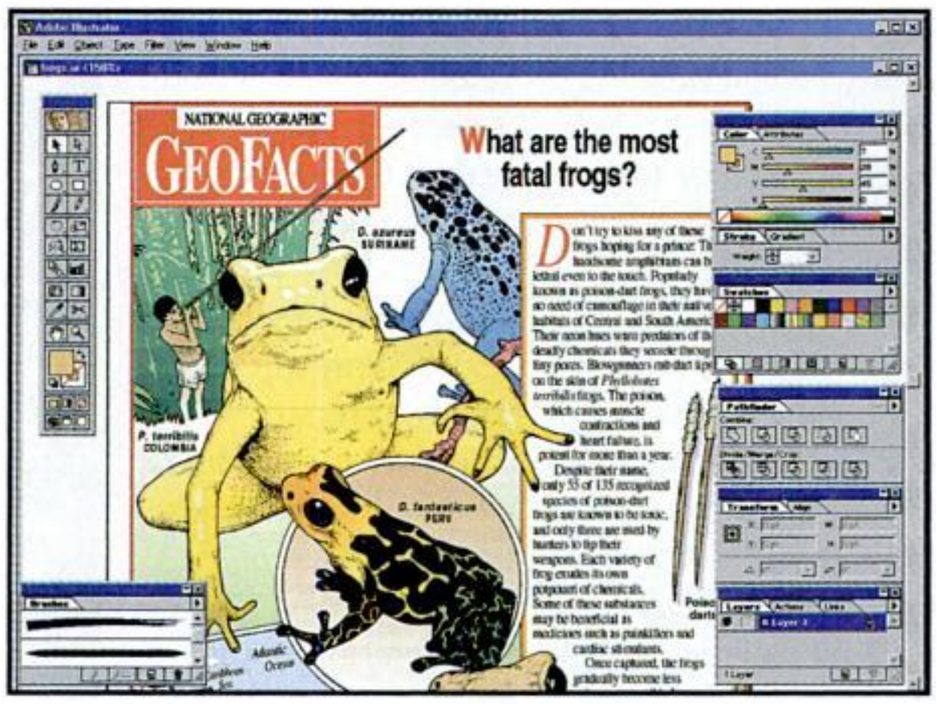
Illustrator 8.0

Talkin' 'bout a revolution

A debate broke out among the *Maximum PC* staff over lunch recently. The question was: Is there any point to venerable apps that seem to go on and on, in version after version, even though they've achieved their stated purpose long ago? *Illustrator* is a perfect case for the continued evolution of the graphics app.

Adobe's eighth sequel to this pioneer vector-based graphics program has added revolutionary features that will forever change the way digital artists work and, at the same time, failed to add support tools that many digital artists desperately yearn for, mandating future versions.

The amazing new gradient-mesh tool allows you to create images with a fresh new look that was previously possible only with raster-based graphics apps that featured natural media emulation, such as *Painter*. *Illustrator 8.0*'s new tool generates color blends that feel more like watercolor than computer graphics, while retaining all the advantages of the format: relatively compact file sizes and scalability limited only by output device resolution.



Illustrator 8.0 packs the power that Bill Pitzer uses to create his GeoFacts infographics for the New York Times News Service.

THE SPECS

REQUIREMENTS

- Pentium
- Windows 95/98/NT
- 32MB of RAM
- 50MB of hard disk space
- 800x600 monitor resolution

PLUSES

- Revolutionary gradient mesh
- Freehand pencil tool
- One-click free-transform tools
- Live blends

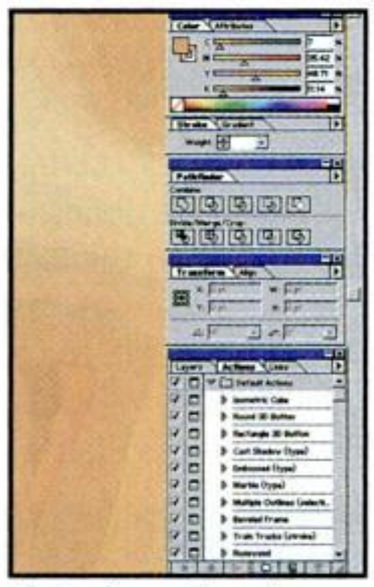
MINUSES

- Lack of web graphics support
- Slow redraws for complex images

Other improvements include a Pencil tool for freehand drawing of bezier lines, freeing the artist from the counter-intuitive task of placing control points and pulling handles to create their shapes. But this new approach all but demands a graphics tablet to get the most out of it; freehand drawing with a mouse requires the touch of a brain surgeon. Still, the Pencil tool lets you get your rough ideas down, then you can use some of *Illustrator*'s other new tools to polish your work. A new Smoother tool effectively takes the kinks out of your freehand lines and reduces the control-point count, for tighter images. And the new Eraser tool operates more like its equivalent in the company's *Photoshop* product.

In fact, the entire *Illustrator 8.0* application has undergone a *Photoshop*-inspired facelift, adopting many elements from the program that won our Best Graphics Software of the Year nod in this issue. Along with this interface convergence comes a melding of key features, such as *Photoshop 5.0*'s excellent Actions palette, which allows multiple selective undos and the creation of saved steps that can be applied to any image. And at long last, the new version of Illustrator preserves layers when exporting to *Photoshop*.

This leads directly to what's lacking. Despite the fact that many artists (perhaps most artists) need both vector- and raster-based programs, and Adobe's done a tremendous job of converging the two realms, the company has no plans to release a merged program. It's probably a fiscal decision, but still a big mistake reminiscent of its decision not to include the web abilities of *Image Ready* in *Photoshop 5.0*.



Photoshop vets using Illustrator 8.0 would be hard-pressed to tell the two programs apart by their floating palettes.

And *Illustrator 8.0* adds no significant support for artists working online, giving a decided edge to *FreeHand 8.0*. Perhaps Adobe has a version of *Image Ready* planned for *Illustrator* owners.

Nonetheless, Adobe justifies version 8 of *Illustrator* by delivering previously unimagined capabilities with the breakthrough gradient-mesh tool and establishes the need for a version 9 by leaving out tools for web graphics.

—Brad Dosland

MAXIMUM PC VERDICT

Price $375
Company Adobe
Phone 800.492.3623
URL www.adobe.com

8

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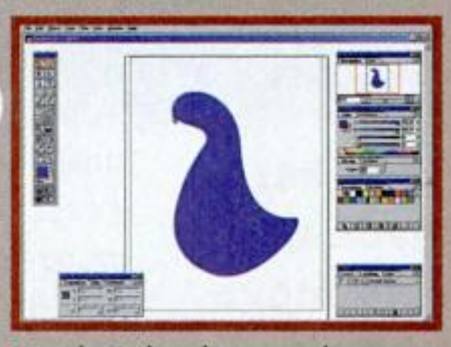
HOW TO GRADIENT MESH

Illustrator 8.0's most impressive new feature is merely a few clicks away.

First, make your shape. It can be a square, circle, freestyle, whatever.

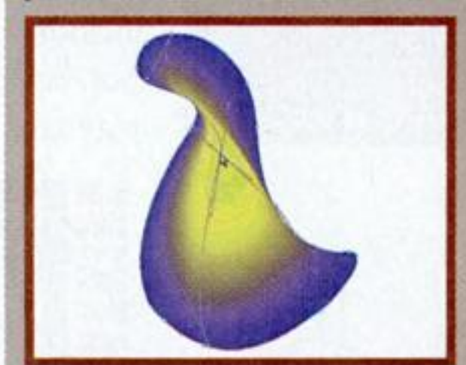
Apply a solid fill color to your shape. Make sure the stroke is set to "None".



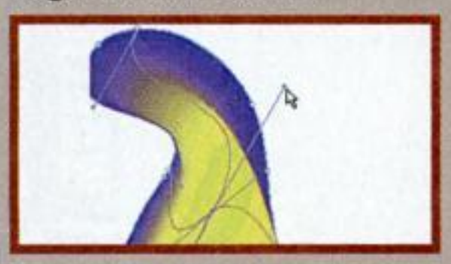
Deselect the shape and go back to the Color palette and select a second color.

Choose the Gradient Mesh tool in the main toolbar.

Now click anywhere within the first shape. A radial blend of the two colors should appear, centered on the point you clicked.



Choose the Direct-Selection tool in the main toolbar and click on the control point you just created. Tweak the handles to get different effects.



Repeat to add other colors and control points to your new mesh.

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Sony VAIO Digital Studio PCV-E308DS

A computer for the living room

Sony has made a bold move to make a PC that would look good in your living room.

Sony's next-generation VAIO is a multipurpose PC that could fit just as easily in the living room by the TV as it could in the office under the desk. With its light weight (17 lbs.) and small formfactor (7.1x12x13.8 inches), it's easily moved around the house. Inside you'll find a 450MHz Pentium II, 128MB of SDRAM, a Matrox G200 2D/3D chip with 8MB SDRAM on the motherboard, and a Sony 5x DVD drive with TV out. And we truly dig that the machine ships with IEEE 1394 connections, a generous 13.6GB UDMA hard drive, and easy-to-use video-capture and -editing software. The 1394 ports (two 6-pin connectors in back, one 4-pin connector in front) let you attach a digital-video camera or deck and capture full-screen, full-motion video at 720x480.

While we praise Sony for creating this pint-sized digital studio, we found some missteps. *DV Gate*, the bundled video-capture and -editing applet, currently works only with Sony cameras, the graphics' chips are soldered onto the motherboard, and there are no full-length PCI slots. Of the four PCI slots you do get, only one is free. Sony also didn't include any large-sized removable media. And because the VAIO doesn't have a free front-panel bay, you can't install one internally.

Other features built into the box include a Sony DVD drive with TV out, which uses Quadrant's software playback. But its output to TV isn't as clean or clear as a dedicated hardware MPEG-2 decoder. Another neat feature is the built-in S-Link connector, which lets you control S-Link-compatible devices. The 17-inch Trinitron monitor (16-inch viewable) is sharp and clear, but the speakers built into the monitor's base are not.

Interestingly, the internal 1394 and TV-out cards have few chips on them, leading us to suspect the motherboard handles the majority of the work. This makes us wonder why Sony didn't just build the DV and TV jacks into the side of the machine, where they wouldn't take up two PCI slots. Oddly enough, when we pulled the faceplate off the machine, we found what looked like the remains of audio and video in/outputs that were never put to use.

On the performance tip, the Sony didn't set any milestones, in fact, when compared to the Gateway P-II 450MHz in the October issue, the VAIO scored lower in the bootMark, SYSmark, Newtek Inspire3D, ForsakenMark, and *Quake II* tests. It did beat the Gateway in the *Photoshop* bench by a full 25 seconds, most likely because the Gateway had 64MB of RAM while the VAIO has 128MB.

Still, while we want to beat Sony up for making a computer with limited expandability, we also want to pat Sony on the back for taking the next logical step in home PC entertainment. We wouldn't buy this machine for our office, but we'd certainly buy it for our living room. The only two things we suggest Sony include are a hardware-based MPEG-2 decoder—because the scan converter in there now just doesn't cut it—and a handle on top of the box for carrying it from the office to the living room.

—Rick Popko

PLUSES

- Small formfactor
- IEEE 1394 in/out
- Generous software bundle
- Easy-to-use editor
- Sharp Trinitron monitor
- 800 tech-support number

MINUSES

- Limited expansion bays
- No full-length PCI slots
- One free PCI slot
- Bad speakers in the base of the monitor
- Simply adequate DVD video out

UNDER THE HOOD

THE BRAINS

CPU	Intel Pentium II 450MHz
L2 Cache	512K pipeline burst
RAM	128MB 100MHz SDRAM (upgradable to 256MB)
Motherboard	Micro ATX
Drive Bays	One 5.25-inch (occupied), three 3.5-inch bays (two occupied)
I/O ports	One S-Video/Composite out, three I-Link in/out, one optical digital out, one S-Link (Control A1), two USB, three serial, one parallel

DISPLAY

Video	Matrox G200 with 8MB SDRAM
Monitor	17-inch (16-inch viewable) Sony Trinitron 0.25mm aperture grille
Res/Refresh	1280x1024/60Hz@32-bit

STORAGE

Hard Drive	Maxtor 91360D8 13.5GB A/V-compliant Ultra DMA 5,400RPM drive
CD/DVD	Sony 5x DVD ROM/24x CD ROM
Removable	Floppy
Fax/Modem	V.90 compatible fax/data modem

SOUND

Sound	Aureal 32-bit PCI Wavetable Vortex (on motherboard)
Speakers	Built into the Sony monitor (generic)

OTHERS

Multifunction keyboard

THE BUNDLE

AOL | Audio/Video center | Netscape | PhotoDeluxe Home 3.0 | Premiere 4.2 LE | Acrobat | CompuServe | Dr. Soloman's Anti Virus | Encarta | Works | Money | Outlook | Motorhead | Quicken Financial Solutions

BOOT 1:11 DOWN 0:05

REAL WORLD BENCHMARKING

CPU/MOTHERBOARD bootMark		189
WINDOWS APPS SYSmark 98	official score	147
HARD DRIVE HD Tach	MB/sec	11.8
CD-ROM CD Tach98	drive rating	3.2x
3D RENDERING Newtek Inspire3D	sec	540
DESKTOP PUBLISHING Adobe Photoshop 5.0	sec	75
DIRECT3D ForsakenMark	fps	64.2
OPENGL Quake2 v3.15	fps	25.8

MAXIMUM PC VERDICT

Price $2,299
Company Sony
Phone 800.571.7669
URL www.sony.com

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EXPANSION NOTES

If you're looking for expansion in a PC, you're better off buying a tower from another vendor. The VAIO only has one free PCI slot and all of the slots are three-quarter length. You won't find any free expansion bays either.

EXPANSION MAP

- **PCI** S-Video out
- **PCI** Free
- **PCI** Sony I-Link
- **PCI** Lucent Modem

IROS

00 System timer	**10** ACPI Holder
01 keyboard	**10** LT Win Modem
02 EISA Pro IRQ	**10** Vortex PCI
03 Com 2	**10** Vortex PCI
04 Com 1	**11** ACPI Holder
05 Sound emulation	**11** Matrox MGA-200
06 Floppy port	**12** PS/2 mouse
07 Printer port	**13** Num data proc
08 CMOS	**14** Bus master IDE
09 ACPI holder	**14** Primary IDE
09 Sony I-Link	**15** Bus master IDE
09 Intel USB host	**15** Secondary IDE
09 SCI for ACPI bus	

DMAS

01 Vortex Sound	**03** Vortex Sound
02 Floppy disk	**04** DMA Controller

Everyone loves a good port The VAIO is extremely user-friendly. On the back are clearly illustrated icons instructing users where they can stick every peripheral.

There's always room for one more The 13.5GB UDMA drive is spacious, and there's room to add another. But because the box is awkwardly configured, you'll have a hard time accessing it.

Don't take this at face value While the VAIO's small form factor is certainly appealing, it doesn't leave you with any internal expansion options. No, Zip, Jaz, or SyQuest for you!

Get FireWired The front of the machine has a conveniently located FireWire and USB port for attaching a USB keyboard or mouse and a Sony digital video camcorder.

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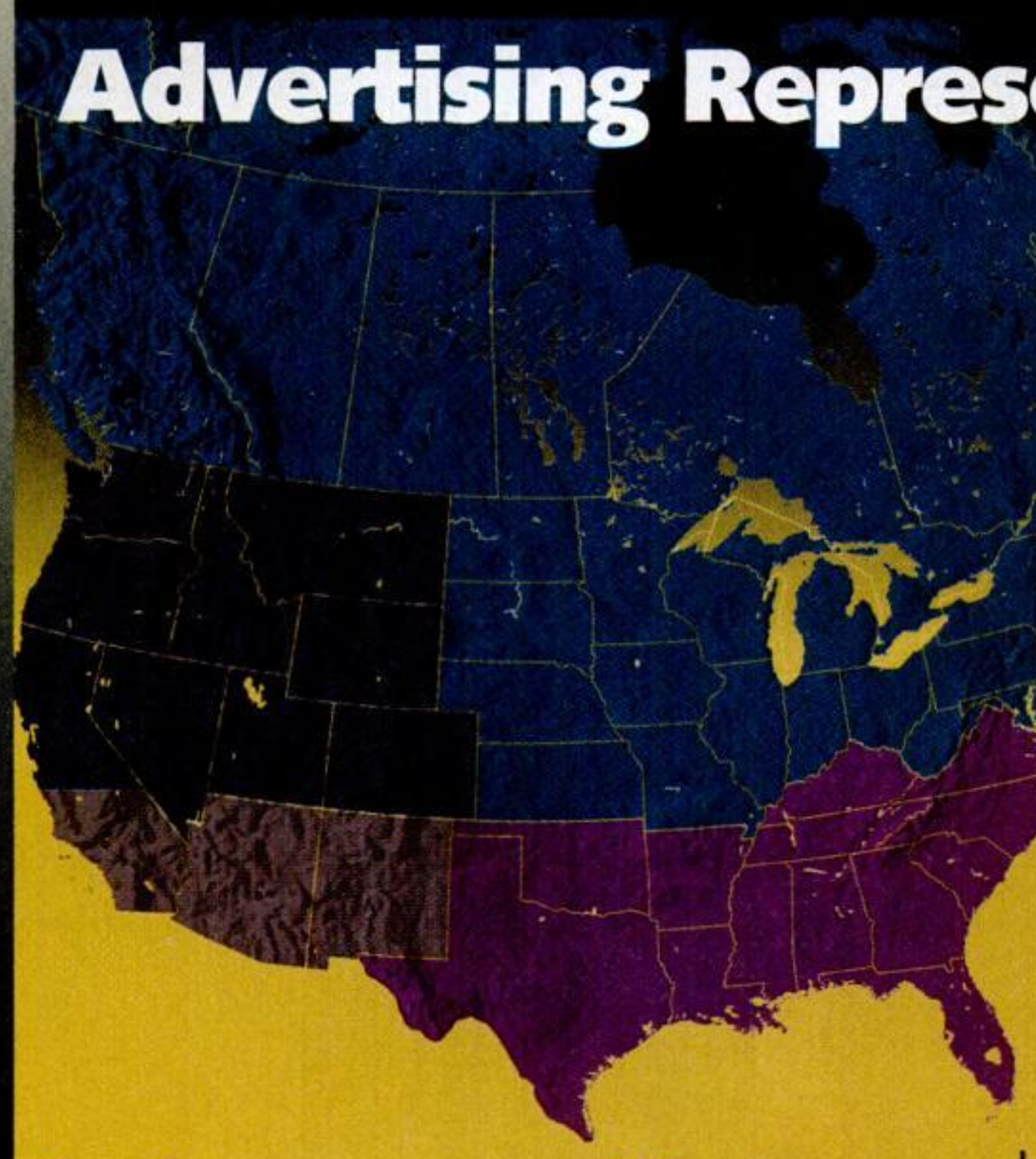

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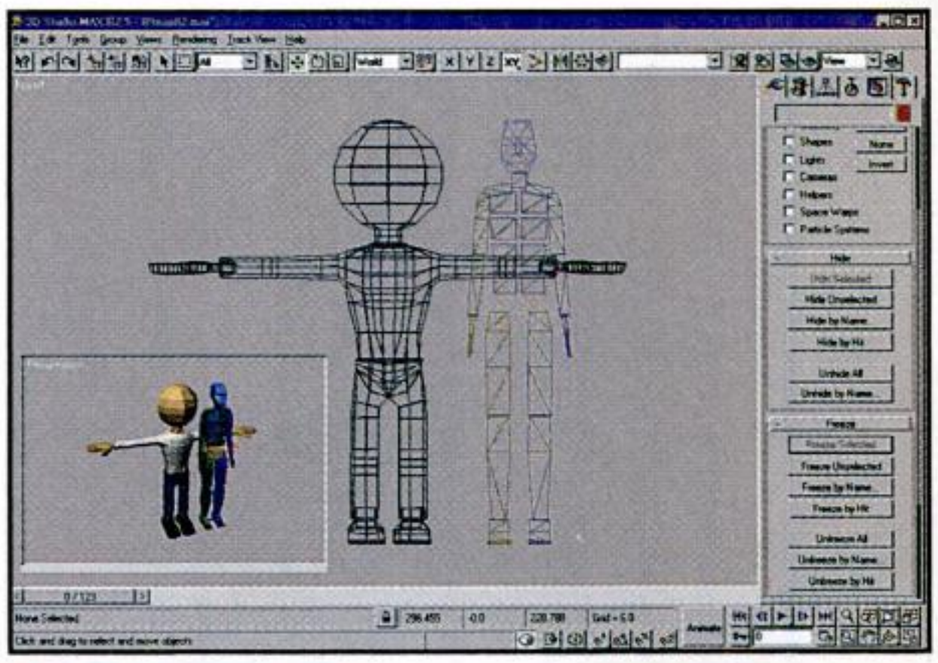
Character Studio 2.0

Walk this way

MAXIMUM PC KICK ASS! product

Adept animators wielding *Character Studio 2.0*, the high-octane plug-in for *3D Studio Max 2.5*, morph from mere polygon pushers into god-like puppeteers. *Character Studio*'s interface provides a simplified way of animating complex hierarchies of joints, which deform a 3D object over time.

Instead of laboriously fashioning a hierarchy of bones by linking them together in the proper order, *Character Studio* automatically creates a biped skeleton with all joints properly placed and linked in one step. And *Character Studio 2.0*'s automated menu icons make fast work of re-scaling figures. In a fairly intricate modeling area such as fingers, this can cut selection time in half. Once the biped and mesh are properly sized and linked, the digital creature is ready for animation. Again, *Character Studio* streamlines animation tasks.



No matter what shape your head is in, Character Studio 2.0 makes cool moves easier.

For experts, Freeform Animation (adjusting individual joint position, altitude, and rotation per keyframe) is always available. Here keyframes can be moved in time individually or as a group and temporal settings made more realistic with ease-in and ease-out controls.

Realistic airborne movement (jumping, leaping, etc.) requires gravity simulation. The object's center of mass can be shifted at will and the amount of "gravity" altered using GravAccel settings. Landing uses ballistic tension settings to simulate shock absorption. Accurate collision detection with the ground plane is automatic.

Limb motion can be a combination of forward and inverse kinematic solutions. Other 3D objects in the animation can be dynamically attached to body parts as well. A baseball can be temporarily linked to the hand when caught and later released when thrown.

Sections of Freeform and Footstep animation coexist peacefully. There is even a conversion utility to extract one from the other.

Anyone familiar with the modifier stack in *3D Studio Max* or layers in Adobe *Photoshop* will appreciate the freedom *Character Studio* layers give an animator. A walking cycle becomes a crouched walk by applying a spinal rotation in a higher layer while the original walk posture is still available in its own layer. This time-saving feature allows testing of multiple keyframe options, viewing them individually or as a composite. When the desired combination is reached, merely delete unwanted material and collapse the layers.

One of the most exciting new developments in release 2.0 is the ability to import and convert motion-capture data from live performances. A creature from *3D Studio Max* and wired in *Character Studio* performs the routine exactly like the original performing artist.

The Motion Flow feature permits an animator to combine a series of routines driven by motion-capture files into a finished animation. Transitions between routines are handled by the software. The plug-in ships with over 150 such routines to get you started.

The icing on the cake is Physique, which permits the creation of bulging muscles and rippling skin.

From macro to micro motion, *Character Studio 2.0* handles it all. It's a must for serious character animators.

—Rick Stevens

Character Studio creates believable hunks.

THE SPECS

REQUIREMENTS

- 3D Studio Max 2.0
- Pentium or Pentium Pro 90MHz
- Windows NT Workstation 3.51
- 48MB of RAM
- 100MB of hard drive swap space
- 800x600/256 colors

RECOMMENDED

- 1024x768/256 colors with PCI bus
- 1280x1024/24-bit double-buffered 3D accelerator

PLUSES

- Over 150 motion-capture files
- Automatic footstep generation
- Visual interface in Physique
- Motion Flow seamlessly splices animation sequences

MINUSES

- Number of choices and sub-menus overwhelming
- In-depth knowledge of character animation necessary

MAXIMUM PC VERDICT

Price $1,495
Company Kinetix
Phone 800.879.4233
URL www.ktx.com

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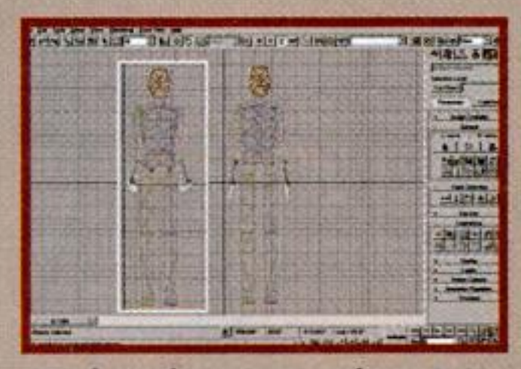
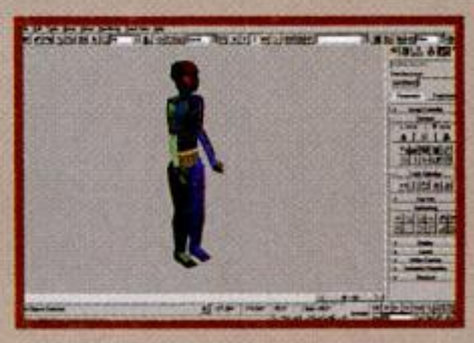
ANIMATING HAND AND FOREARM MOTION

- Select Biped in Create Mode. In Front view, drag out a rectangle, filling the viewport to create a Biped. Maximize the Front viewport by pressing [w].
- Open Motion section. Marquee-select the Biped's left hand. The lower arm and hand are selected automatically.
- Click Symmetrical in the Track Selection rollout. Now the right lower arm and hand are selected as well.



Biped at right is at rest on frame 0. At left in the white box, hands and arms are rotated into position.

- Click Animate, and click once on "set key" in the Keyframing rollout. Advance to frame 30. Click Rotate Transform and activate the z-axis. Drag upward with the mouse button pressed over the left lower arm (it will become a rotate cursor) to curl both hands to -24°. Answer yes to the warning box about creating a freeform animation only—this will not have footstep movement.
- Advance to frame 60. Drag downward with the rotate tool until the hands and fingers extend slightly outward. Advance to frame 90 and drag upward until the hands are rotated -18°.
- Activate the x-axis and drag downward rotating 34° so that the palms are facing you. Click Animate to deactivate inverse kinematics.
- Rewind to frame 0 and click Play to see your animation.



In perspective view, it's easier to see how much animation keyframing has been accomplished in few steps.

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"The first word that comes to my mind when describing NVIDIA's new TNT 3D graphic accelerator is WOW! The visual quality and frame rates...were astounding."

—Maximum PC, www.maximumpc.com

"...performance was better than any 2D/3D combo card I've seen. On top of that, games like Quake II and FLIGHT SIMULATOR 98 looked spectacular at 1024x768 and 1280x1024 (respectively)."

—Computer Gaming World, September 1998

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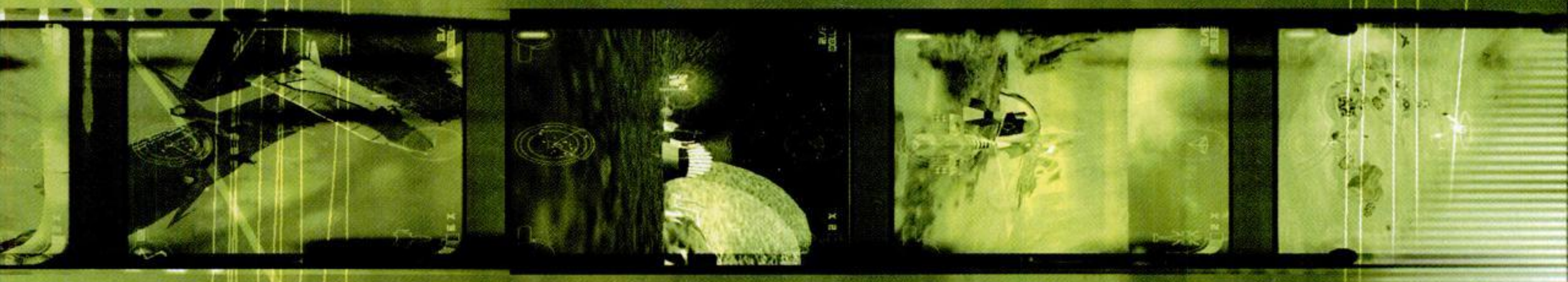

"...performance so extraordinary it will change the next generation of games."

"Imagine Quake II at 1600x1200 at over 30fps. Imagine DeathMatch Quake II at 1600x1200 — you can see the other guy before he sees you. The TNT will likely be the hot ticket in AGP cards in the near future."

—Computer Gaming World, September 1998

"A true 'supercard'...offers complete 2D and 3D compatibility, as well as the best Direct3D performance available...gaming will never be the same at resolutions of 1024x768 and above."

—Adrenaline Vault, www.avault.com

- RIVA TNT™ 128-bit 3D/2D and video accelerator
- 16MB of memory for resolutions up to 1920x1200
- 250MHz RAMDAC for refresh rates up to 160Hz
- Output to monitor or TV (s-video & composite)
- Windows 95, 98, NT and OpenGL support
- Lifetime warranty and unlimited toll-free support
- Available for AGP and PCI bus

"...competing in an arena with the likes of the Savage 3D, Banshee and G200. All of these it will beat handily...they are the Kings of the 2D/3D combo card!"

—RivaZone, www.rivazone.com

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Voodoo Banshee Bonanza

Screaming for vengeance

In case you missed the preview back in the October 1998 issue, Voodoo Banshee is a 2D/3D-video accelerator that uses single texelfx2/pixelfx2 Voodoo² technology. Capable of handling up to 16MB of SGRAM or SDRAM, Banshee can command up to a 250MHz RAMDAC for crystal-clear 2D desktop display. Besides Direct3D and OpenGL, Banshee also supports 3Dfx's native Glide API.

Banshee was crippled even before its birth, in light of its competition's feature sets. Limited to a PCI or AGP 1x/DMA implementation, this architecture cannot directly access and execute textures from system memory. A triple-buffered game at 1024x768 using 10MB of 16-bit high-resolution textures will choke an 8MB Banshee. We recommend going with a 16MB board. Also, since it doesn't have dual-texture-processing units, games that use multitexturing will see a performance hit as well. But, in 3Dfx's defense, they never told anyone Banshee would be a Voodoo² killer—this card is designed for more mainstream performance.

Final rendering at 16-bit (64K colors) limits the Banshee's visual panache compared with nVidia's TNT, S3's Savage3D, and Matrox's MGA-G200, which are all capable of 24-bit z-buffered 3D rendering. While this won't affect current games, future polygon pushers will start reaching into the 16 million color palette, thus putting Voodoo Banshee in a disadvantage. Heck, *Quake III Arena* will use 24-bit textures. The 256x256 maximum texture size will also affect games relying on higher resolution textures (the chip will downsample any higher res texture to 256x256).

Hardcore performance mongers will bypass Banshee for more powerful solutions currently shipping, but those wanting Glide compatibility in a single 2D/3D card, should look at these Banshee boards and see just how they scream.

—Andrew Sanchez

Quantum3D Raven AGP

PLUSES
- Cool bundle
- Glide support in a single card

MINUSES
- Slower than other Banshee boards reviewed
- No AGP texturing
- 256x256 maximum texture size

Guillemot MaxiGamer Phoenix PCI

PLUSES
- The cheapest Banshee board of this bunch
- Uses faster SGRAM
- Glide support
- As fast as a solo Voodoo2 board

MINUSES
- No AGP texturing
- 256x256 maximum texture size
- PCI means it may bog down during triangle-intensive apps

Diamond Monster Fusion AGP

PLUSES
- InControl one-touch resolution change is always rico-suave
- Mini-fan on processor
- Accelerates D3D, QuakeGL, and Glide apps
- Fastest board of the bunch

MINUSES
- 3D portion of control panel not as tweakable as 3Dfx reference drivers
- No AGP texturing
- 256x256 maximum texture size
- No Win9x OpenGL ICD (NT4 only)
- Most expensive board of this roundup

Quantum3D Raven AGP

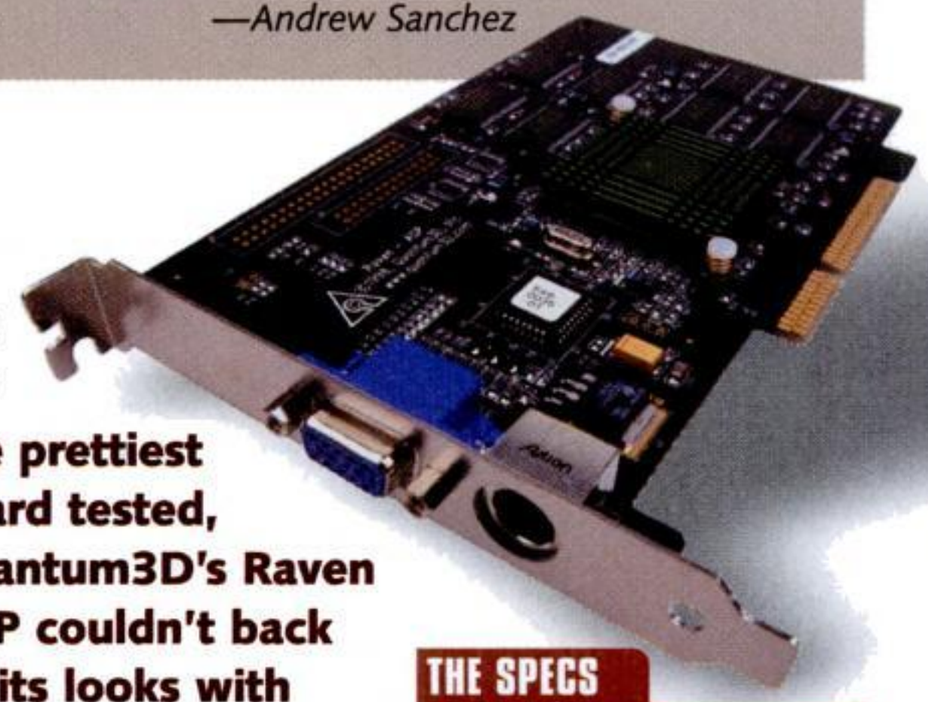
Known for high-end 3Dfx craziness, Quantum3D goes mainstream with its Raven.

Breaking from custom-engineering, Quantum3D opted for a standard 16MB SDRAM 3Dfx reference Banshee design. There are no TV outputs, and the lack of internal header connectors means no upgrade modules for you. Besides the monitor output connector, there's a stereo glasses port.

Drivers also follow reference convention, with custom gamma settings for desktop, D3D, and OpenGL/Glide at your fingertips.

We dove headfirst into in benchmarking, and came up with some underachieving numbers. Across the entire suite, the Raven consistently fell short. At 800x600 *Quake II*, the Monster Fusion outpaced the Raven by almost 9fps. At 800x600 *Forsaken*, the performance seemed bound to the refresh rate by spewing a score of 60fps—one-half the 120Hz refresh rate. Even disabling V-Sync, the most we could squeeze out of the Raven was 88fps—a full 10fps slower than the Monster Fusion. Quantum3D is aware of this problem and plans to address it with upcoming driver revisions.

Unless you have some weird allegiance to Quantum3D, get another Banshee board.



The prettiest board tested, Quantum3D's Raven AGP couldn't back up its looks with benchmark scores.

THE SPECS

MAX 24-BIT RES/REFRESH RATE	1920x1440/60Hz
MAX 16-BIT RES/REFRESH RATE	1920x1440/60Hz
VESA 2.0 COMPLIANT?	Yes
AGP?/LEVEL	Yes/1x DMA
BUNDLE	Win95/98 drivers I full versions of Midway's NFL Blitz, Gex: Enter The Gekko, and SF Rush: The Rock/Alcatraz edition

REAL WORLD BENCHMARKING
FORSAKEN 800x600 fps 60.4
FORSAKEN 1024x768 fps 58.9
BATTLEZONE 800x600 fps 26.0
BATTLEZONE 1024x768 fps 21.0
QUAKE II 800x600 fps 35.7*
QUAKE II 1024x768 fps 26.2*

MAXIMUM PC VERDICT

Price $149
Company Quantum3D
Phone 888.747.1020
URL www.quantum3d.com

5

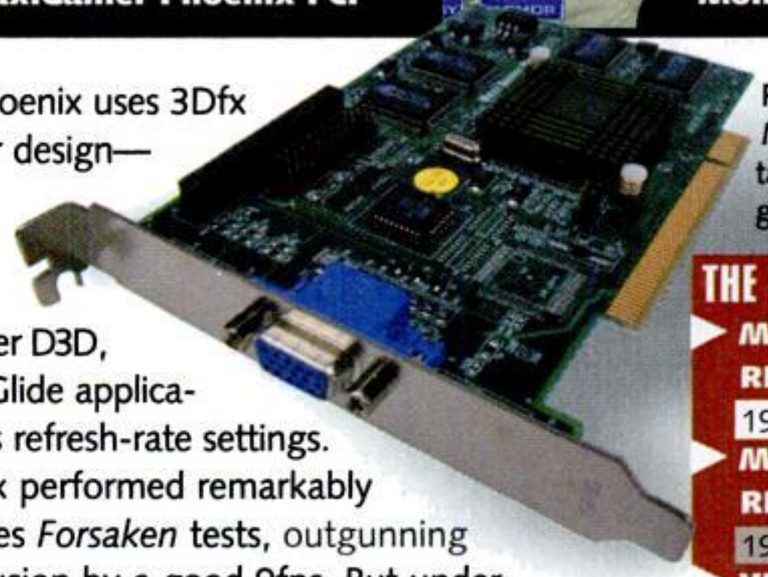
Note: V-Sync is enabled for all results. Benchmarks were taken at the highest refresh rate the videocard would allow (800x600@120Hz, and 1024x768@100Hz), to alleviate any V-Sync bottlenecks.* Using 3Dfx OpenGL driver

Copyrighted material

Guillemot MaxiGamer Phoenix PCI

Available in either AGP 1x/DMA or PCI (tested here), this Voodoo Banshee board packs 16MB of 100MHz SGRAM (via eight 2MB chips), as opposed to slower SDRAM. A low-profile heatsink adorns the Banshee processor.

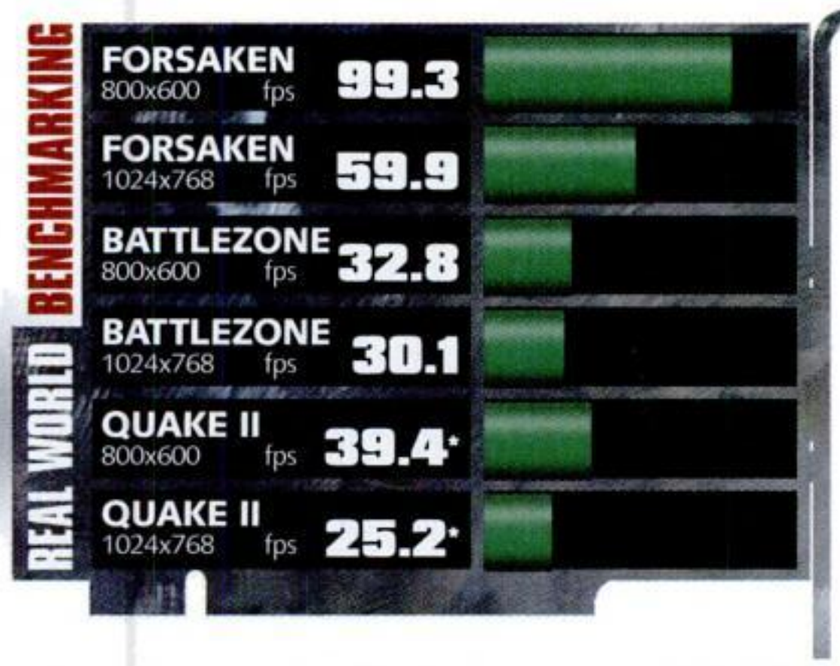
Don't expect TV-outputs at this price. But dual-internal-header connectors allow add-in daughterboards. The Phoenix uses 3Dfx reference driver design—this is a good thing, as they provide precise RGB control over D3D, OpenGL, and Glide applications, as well as refresh-rate settings.



PCI fans —the Guillemot MaxiGamer Phoenix can take care of all your 3D gaming needs.

The Phoenix performed remarkably well in the hi-res *Forsaken* tests, outgunning the Monster Fusion by a good 9fps. But under *Battlezone* (with its higher-resolution textures) and *Quake II*, the Phoenix dropped frames compared to its AGP counterparts. Visual quality remains high, with all alpha-blends and lighting effects in D3D and OpenGL appearing as they should.

Overall, a good performer.



THE SPECS

MAX 24-BIT RES/REFRESH RATE
1920x1440/ 60Hz *32-bit

MAX 16-BIT RES/REFRESH RATE
1920x1440/ 60Hz

VESA 2.0 COMPLIANT?
Yes

AGP?/LEVEL
No

BUNDLE
Win95/98/NT 4.0 drivers | Half Life Day One OEM | full version of Tonic Trouble | demo versions of SCARS, Redline Racer, Hexen II, Jedi Knight, Shadows of the Empire, Incoming, and Sub Culture

MAXIMUM PC VERDICT

Price $89 (after $20 rebate)
Company Guillemot
Phone 888.893.2648
URL www.guillemot.com

8

Diamond Monster Fusion AGP

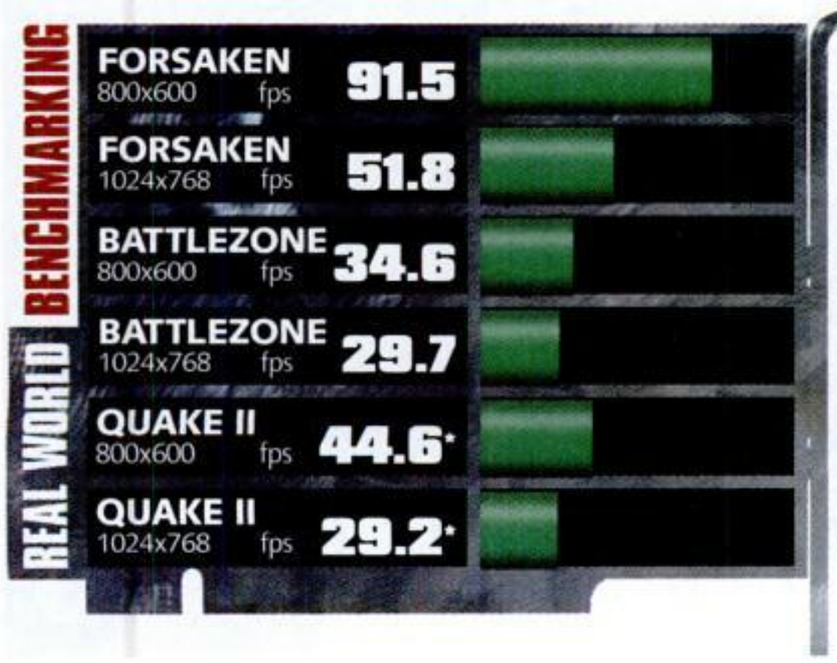
Following the reference ATX design almost to the letter, the Monster Fusion (available in both AGP and PCI flavors) comes with 16MB of 100MHz SDRAM. Unlike the other boards in this roundup, the Monster Fusion's video processor is protected by a firmly attached MEI mini fan—excellent. A monitor port is the sole connector.

Diamond is usually spot-on with its one-touch InControl applet, which allows single-click resolution changes. Upon closer inspection, though, Diamond's refusal to use the Banshee reference driver control panel robs the board of gamma correction and refresh-rate adjustments.

Under our slew of benchmarks, the Monster Fusion flies at 800x600 D3D gaming—not as fast as TNT, but impressive nonetheless. While *Quake II* performed fine at high resolutions, *SiN* got choppy at this res. Visual quality is typical Voodoo fare—clean and sharp, but with those thin horizontal bands throughout the scenes. Alpha blends and transparencies appear as they should, but gamma settings are turned down without that washed-out fade.

The Monster Fusion AGP is a solid product, even with the dumbed-down drivers.

We love the Diamond Monster Fusion's performance, but please ditch the useless control panel benchmark.



THE SPECS

MAX 24-BIT RES/REFRESH RATE
1152x864/60Hz (* 32-bit)

MAX 16-BIT RES/REFRESH RATE
1920x1440/60Hz

VESA 2.0 COMPLIANT?
Yes

AGP?/LEVEL
Yes/1x DMA

BUNDLE
Win95/98/NT 4 drivers | OpenGL ICD (NT4.0) | Unreal SE (11 levels)

MAXIMUM PC VERDICT

Price $160 ($150 for PCI version)
Company Diamond Multimedia
Phone 800.468.5846
URL www.diamondmm.com

8

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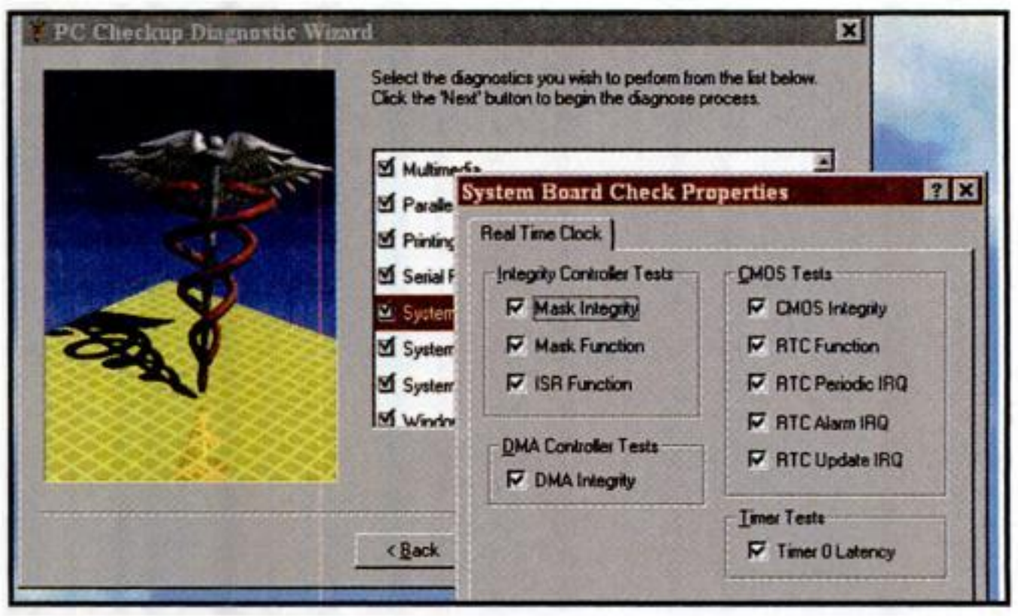
Nuts & Bolts 98

Pop the hood and tune your PC



MAXIMUM PC KICK-ASS! product

Constantly installing and uninstalling software fragments your hard drive and bloats your registry, eventually causing sluggish performance. *Nuts & Bolts 98*'s power tools optimize performance and safeguard against future problems. However, casual users may not understand everything the program does for them.

Nuts & Bolts 98 is made up of four parts, all accessible from an easy-to-use interface panel. Repair and Recover includes an undelete utility and Discover Pro, which tells you more than you probably wanted to know about what's going on in your computer. Clean and Optimize includes several utilities to recover lost hard drive space and increase system performance, including a registry wizard and disk tuner. Prevent and Protect includes a crash-protection utility, a program that protects against unintentional deletes, a year-2000-compliance checker, and a virus scanner. Finally, Secure and Manage provides zip and encryption utilities.

THE SPECS

REQUIREMENTS
386 or higher
Windows 3.1, 3.11, 95, 98
8MB RAM
30MB hard disk space

PLUSES
- Lots of utilities
- Powerful configuration and optimization tools
- Easy to set several Windows options

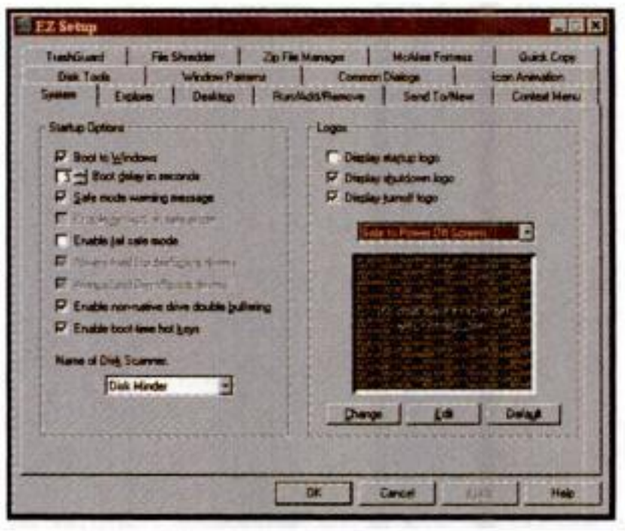
MINUSES
- Possibly overwhelming for beginners

Of these utilities, DiskMinder, Disk Tune, and Cleanup Wizard stand out. DiskMinder works like Windows' Scandisk, but gives you more control over what to check for via a properties box. At the same time, there isn't always enough information to use the properties available (we couldn't find a definition of "non-ANSI file" anywhere in the online help files); however, it does run faster than ScanDisk and has a more comprehensible interface.

Disk Tune is a souped up defragger that gives exceptional control over file placement on your hard drive. It speeds up your hard drive by intelligently reordering files and optimizing the Windows swap file while it defrags. By default, it automatically places key Windows components in front of the disk where access times are the quickest, but you can change these settings to speed the load times of other apps.

Nuts & Bolts 98 is the most comprehensive toolkit for tweaking and optimizing your PC's performance.

While the Cleanup Wizard was slow compared to other cleanup utilities, taking an incredibly long seven minutes to complete a drive search, it offers more ways to deal with the excess baggage found. When the search ended, the wizard walked us through removing cache files and duplicate or outdated files. With the options to zip, shred, recycle, move, delete, or rename, we got rid of these files and saved a desperately needed 25MB on our hard drive.



EZ Setup puts many Win95/98 customization features into your hands, such as tweaking what Windows does at startup, to changing context menus.

Other new utilities add considerable power to the *Nuts & Bolts* toolbox. With PC Checkup, *Nuts & Bolts 98* expands its diagnostic abilities to resolve hardware and software configuration problems. Retake backs up specific file types to a protected hard drive partition. Launch Accelerator speeds up app launch times by monitoring the support files used as an application loads and optimizes the read order.

Nuts & Bolts duplicates many items in Windows 98 to some degree—for example, Windows has a Registry editor. However, *Nuts & Bolts* divides its editor into several different "wizards" designed to perform specific tasks—cleaning unneeded registry data, or backing up the Registry.

Nuts & Bolts 98 gathers an incredible amount of data in one place that would take several steps using Windows. The Discovery module, for example, uses graphs and easy-to-understand displays to provide information on everything from hardware to software to current memory allocations.

This program isn't for beginners. *Nuts & Bolts 98* has a reasonable help file for its many functions, but beginning users could easily be overwhelmed by the variety of choices offered by this program. Nonetheless, *Nuts & Bolts* is an intense amalgamation of utilities that advanced users will be able to tweak for days.

—Tara Calishain

SPEEDING UP LAUNCH TIMES

	INITIAL LOAD TIME (SEC)	AFTER DISK TUNE (SEC)	AFTER LAUNCH ACCELERATOR (SEC)
APPLICATIONS			
Microsoft Internet Explorer 4.0	6.0	3.8	3.5
Netscape Navigator 4.06	8.0	7.6	7.5
Microsoft Word 97	2.5	2.4	2.3
Microsoft Outlook 98	3.4	3.0	2.8
Adobe Photoshop 5.0	11.3	11.2	8.7
GAMES			
Quake II 3.19	24.1	24.0	24.0

MAXIMUM PC VERDICT

Price $40
Company Network Associates
Phone 800.332.9966
URL www.mcafee.com

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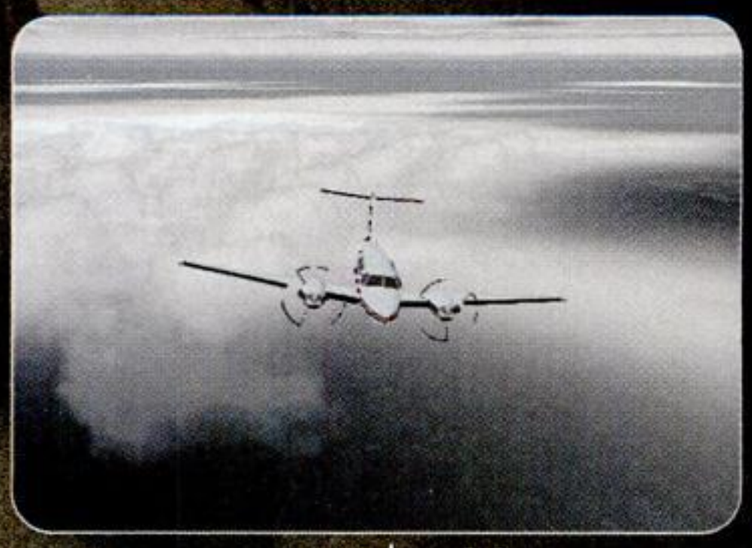
ONCE YOU GO UP, YOU NEVER COME DOWN.



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Universal Speaker Bus

Sound systems ride the digital bus

Windows 98 is here, and Intel's Universal Serial Bus is a reality. Along with the bevy of USB mice, keyboards, and hubs you'll see, will be a nouveau speaker technology that takes advantage of all this new bandwidth—digital sound.

In this new sonic scenario, audio data is sent from your software down the USB pipeline as a digital signal, then your USB speakers convert it to the analog signal they need to sing. These USB speakers actually bypass your soundcard as a sound output device, which in theory bypasses all the noise interference introduced into the signal chain by devices such as fans and power supplies.

Basically this process replaces your soundcard with a virtual CPU-powered soundcard, complete with basic 16-bit Sound Blaster capabilities, but no A3D or EAX compliance.

Still, manufacturers must produce a speaker system devoid of extraneous snaps, crackles, and pops. After all, no amount of technological hocus-pocus can hide substandard design and implementation.

Here are three first-generation digital speaker systems, primed and ready to rock your desktop.

—Andrew Sanchez

Altec Lansing ADA 70

Among the first to enter the USB fray is Altec Lansing, and the ADA 70 is its entry-level digital speaker setup.

This three-piece system consists of a one-inch plastic dome tweeter/three-inch paper midrange housed in a sealed, plastic satellite. The right satellite has a free-rotating multi-function potentiometer wheel, serving as both master volume control plus power, treble, and bass control. A PS/2 control cable runs from this speaker to the 100Hz-tuned vented subwoofer box (made from particle board), which houses a single, six-inch, long-throw paper subwoofer of the dual voice coil. Inside this box sits the amplifier and I/O ports. Each satellite gets 7 watts, while 20 watts feeds the bass. An active filtering system uses 150Hz as the dividing frequency between subs and sats.

And if you don't want to deal with USB, two 1/8-inch mini-stereo jacks for old-school analog connections.

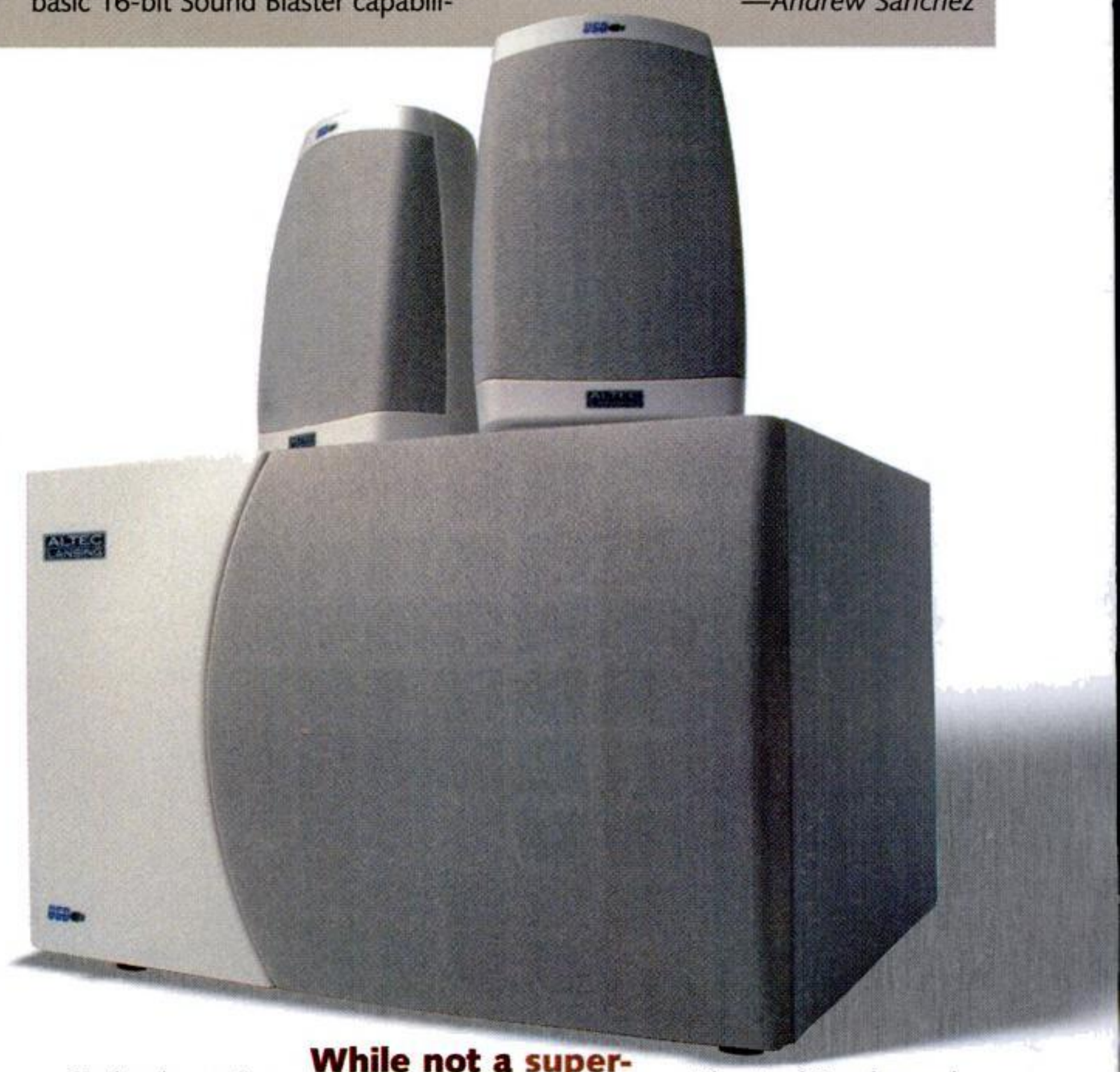
Altec offers a downloadable beta of its Audio Management Software, which adds a tiny volume control icon in the lower right corner of your desktop. With this program, you can save specific equalization settings, as well as tailor your sound. It's gaudy in appearance, but it gets the job done.

Installation was uneventful, with Win98 recognizing the hardware and installing the appropriate HID drivers. Curiously, the OS banishes your CD-audio volume-control slider in your Control Panel, thus forcing you to use your Wave volume control to adjust CD audio output.

Both satellites are well shielded, so don't worry about monitor distortion.

PLUSES
Great overall sound

MINUSES
No deep bass
Altec Volume Control applet buggy



Under the audio knife, the subwoofer plays smooth, rich bass in the 60Hz to 80Hz region, with the low frequencies rolling off below 40Hz. Not tsunami-summoning bass, mind you, but solid and defined.

While not a super-deep bass-o-matic, Altec Lansing's USB-powered ADA 70 certainly gets the job done.

The satellites' soundstage is also rock-hard, with a strong center channel clearly audible under our tests. When cranked up to maximum, the system strained with bottom-end distortion during loud bass tracks. During intense *Quake II* sessions with CD audio enabled, gameplay framerates never dropped below those you'd expect with a traditional soundcard setup.

Bass and treble controls provide enough oomph on the low and high end to add boom and sparkle to the mix, although equalization abuse can lead to harsh highs and bottoming-out bass.

Go easy on that darn equalizer and these next-wave speakers really sing.

MAXIMUM PC VERDICT

Price $150
Company Altec Lansing
Phone 800.648.6663
URL www.altecmm.com

8

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Labtec LCS-1040 Studio Reference Series

The company usually known for substandard speakers is making a bid for sonic excellence, and Labtec's LCS-1040 is its entry into both the high-end and USB. Eschewing the three-piece sub-woofer/satellite combo prevalent these days, the LCS-1040 consists of a pair of full-range speakers, with a lone three-inch, foam-surround, full-range speaker inhabiting the hefty, vented-plastic enclosure, which is tuned to 50Hz. Why a tweeter wasn't included in the package boggles the mind.

PLUSES
Cheap price

MINUSES
No deep bass

The left speaker houses the 7ft USB cable connector, while the right speaker has a dual 1/8-inch female mini-stereo-input plugs, left speaker output, and the power connector. Unfortunately, the AC adapter ends in a fat brick of a plug—not good at all for power strip users. The integrated amplifier powers the system with 5 watts a pop. The right speaker's front control panel includes a master volume control, a treble knob, and a 1/8-inch stereo headphone connector.

Again, installation, as with all the USB speakers, was painless, with Win98 adding in the three necessary drivers to the mix.

As expected, deep, satisfying bass is nowhere to be found with these speakers—after all, a three-inch cone only travels so far. Within its defined frequency range, however, the LCS-1040 concedes a flat, rather bland response. The treble control adds much sizzle to the high end—again, be careful with over-equalization, as it will add a harsh ringing to the speaker's sonic signature. Midbass is present, but not rich enough to add super-low-frequency presence. Cranking up the LCS-1040 resulted in massive distortion across the poor three-inch driver, and a low-power amplifier means you won't be detonating room-shaking BFG blasts anytime soon.

Labtec can't expect deep bass from a puny three-inch speaker.

For a few dollars more, you can get into a full-blown subwoofer/satellite system and truly demolish your desktop.

These aren't the speakers you're looking for.

MAXIMUM PC VERDICT

Price $70
Company Labtec
Phone 360.896.2000
URL www.labtec.com

4

Philips DSS370

This three-piece subwoofer/satellite combo is the burliest of the bunch. The 5.25-inch cone subwoofer is nestled inside a vented-plastic enclosure. A solo volume knob controls woofer output. The subwoofer houses its own dedicated 30-watt amplifier, and the DSS370's right satellite speaker houses a 15 watt x 2 amp. A single four-inch midrange and two-inch tweeter lie nestled behind the satellite's protective grill. Volume control, Dynamic Bass Boost, and Incredible Surround round out the button options. I/O duties include a mini-stereo jack, left-speaker output, a DIN power connector, subwoofer output, and USB cable.

Installation was painless, and Philips gets an A+ for providing its Phoenix Control Applet software, which adds an easy point-and-click adjustment interface for your USB devices, including bass and treble equalization and USB port utilization.

Sonically, these speakers sound great at low and medium volumes. Philips left substantial bass in the satellites, translating into very pronounced mid-bass punch. The sub went down to about 35Hz, although there's an audible dip in the 45Hz to 50Hz region. 60Hz on up was loud, but with the satellites crossed over so low, a good amount of bass also rattled through the tiny four-inchers. Remarkably, the satellites handled the bass gracefully, and the center-channel positioning is solid. The dreadful Incredible Surround algorithm should have been called Incredible Distortion, because that's what this button induces. Music and games sound much cleaner without the surround algorithm. Also, tiny pops and snaps made us ease up on the CD-audio volume.

These vented satellites are some of the biggest beasts we've ever encountered.

If these speakers were much smaller and much cleaner sounding, they might get our recommendation.

PLUSES
Very good up-front bass response
Excellent control applet

MINUSES
Incredible Surround is incredible bunk
Audible snaps at high volumes
Big satellites

MAXIMUM PC VERDICT

Price $199
Company Philips Magnavox
Phone 770.821.2400
URL www.usbaudio.philips.com

7

EVERYTHING YOU REALLY NEED FOR USB SPEAKERS.

Before hopping on the Universal Serial Bus, make sure your system is ready to handle the madness. Here's a quickie checklist of requirements:

- **USB ports:** This may seem like a no-brainer, but some early Win98 PCs may not have USB ports! If you own any of the later core-logic chipset motherboards, such as Intel's 430TX (for Pentiums), 440LX, and 440BX (for the Pentium II), and you own an AT formfactor motherboard, check the back of your rig for USB header connectors. If your board has them, talk to your mainboard maker and get some USB ports.
- **Windows 98:** While Win95 OSR2.1 worked for basic USB, these digital speakers require realtime digital-audio conversion, especially with CD-audio. Of course, you can just use these things in analog mode, but what's the point of spending the money if you don't use the speaker's coolest feature?
- **Proper USB drivers installed and free of conflicts:** If you're upgrading from Win95 and have USB ports, make sure your BIOS has enabled the USB ports and that the drivers are properly installed and free of conflicts by right-clicking on your My Computer icon to get to your System Properties. Then, click on the tab labeled Device Manager and scroll down to the bottom of the listing. Your USB drivers will be loaded there and should not have any yellow or red icons sitting next to the listing. If there are, reinstall your drivers.
- **CD-ROM drive capable of digital audio output:** Most drives "claim" they're capable of digital audio extraction, but few actually are. The only way to test your CD-ROM is to plug in a USB speaker system, then enable Digital Playback in the CD Music options section of your Multimedia Properties sheet. If your CD audio is glitchy after restarting, your drive may not be up to snuff. This will affect all CD audio, even in games, that relies on it.

Unless your drive has some type of upgradable firmware or software update, you may just be out of luck.

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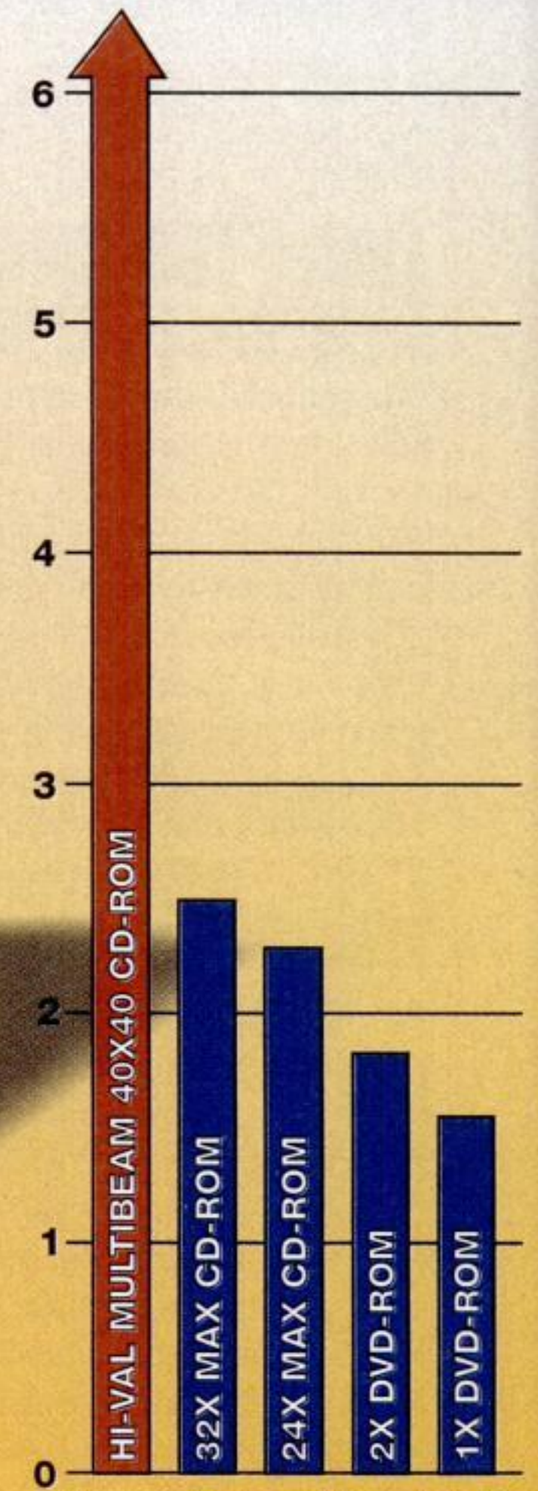

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Shogo: Mobile Armor Division

Mech mayhem

Giant robots set your screen ablaze in Shogo: Mobile Armor Division.

Anime meets polygons in *Shogo: Mobile Armor Division*. Inspired by Japanese giant-robot flicks such as *Orguss*, *Appleseed*, and *Macross*, *Shogo* is brimming with white-knuckled mecha combat stymied by cinematic faux pas.

Strapping into your humanoid Mobile Combat Armor (MCA), you'll dispense death in any number of high-powered projectile ways. With two movement modes (vehicle and bot) and tons of cool weaponry, the metal will fly as you duck behind buildings and leap rooftops. You'll also go street-level as you run and gun in a *Quake*-like environment.

Shogo is Monolith's maiden voyage with its LithTech 3D gaming engine. Using Direct3D as its only hardware renderer, LithTech pumps polygons with the best id and Epic Megagames have to offer. Special effects galore adorn *Shogo*. You can't help but gawk at the awesome semi-transparent smoke trails from multi-rocket launches, or the searing explosion when you nail an enemy MCA with your Juggernaut cannon. Colored lighting, alpha-blended explosions and water, and details such as shadow-casting clouds, make *Shogo* shine. Unfortunately, the 16-bit texture size is limited to 256x256 pixels (a bow to 3Dfx), resulting in some pixelation.

On the performance tip, LithTech can do on-the-fly polygon level-of-detail adjustment. With the correct video-card, you can get up to 1024x768 or greater, but expect framerates to bog down when multiple mechs attack and guns blaze. Realistically, you can expect framerates to hover between 20fps and 30fps and higher. Thankfully, Monolith provides an easy-to-use Advanced Display properties sheet where you can enable triple-buffering, polygon gap fill-in, and more.

Where *Shogo* nails down the action, the cinematics require major work. Much of the story is told through static text screens—yawn. Other major storyline chunks use the in-game engine to show characters interacting, and here's where Monolith dropped the ball. Despite the dialogue, there are no animated textures for facial expressions and mouth movement. Also, the cinematics use the generic overhead circling shot—no close ups, profile shots, or any other type of camera work are used. And the AI (term used loosely) devolves to enemies either sidestepping their way to certain death or ignorance of the fact that you just capped his neighbor.

Lock-and-load, lads and gals, because Shogo gets intense.

The worst thing about *Shogo* is the length of the game—it's short! We finished both story lines in less than 15 hours. Thankfully, Monolith provides easy multiplayer mayhem via all your favorite networking protocols, and folks can set up dedicated *Shogo* servers. Mech combat is grand, but the MCA-less firefights just aren't fun. Loading time is horrendous, and lag galore stymied our multiplayer ruckus.

Shogo: Mobile Armor Division is the closest anyone has come to marrying intense first-person mecha action with the flair and character design of Japanese anime. But it could have been so much more.

—*Andrew Sanchez*

PLUSES
- Mecha mayhem on your D3D accelerator
- Original LithTech engine pulls off intense visual effects
- Different modes of play keep things interesting
- Fun multiplayer mayhem

MINUSES
- Waaay too short
- In-game cinematics use generic camera angles
- Voice acting strained
- Clipping problems
- AI not so intelligent

THE SPECS

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SOUNDCARD	
DirectSound-compliant	
MULTIPLAYER	
TCP/IP (dedicated server capable)	
IPX	
Modem	
Serial connection	

MAXIMUM PC VERDICT

Price $50
Company Monolith
Phone 425.739.1500
URL www.lith.com

6

SNIPING YOUR WAY TO VICTORY

Sometimes, staying out of sight and picking people off from a distance is not only sanctioned, but necessary for your own survival. Here are some hunting pointers.

- **Recognize your sniper weapons.** Use the Aegis AT-S4 rifle when on foot, and the Sniper Rifle when in the MCA. These two weapons zoom to get you up close without putting you in harm's way.
- **When to snipe.** When ensconced in your MCA, be aware of your surroundings, especially in the cityscape levels. Some foes tend to wait at street level facing a certain direction, so if you can outflank them and use your zoom-in you can nail them in the head a couple of times for some critical hit damage before they go down. Press the Sniper Rifle twice—once to choose the weapon, the second time to zoom-in. Use this to pick off MCAs standing on roads or buildings above you.
- **Use cover whenever possible.** It's cheap and low-down, but it works. If you know an enemy is around the corner, move ever so slightly until you see a limb or any other part. Whip out your rifle or Skalla Arms M25 submachine gun and tear into that limb. You'll kill them and they'll never see you. This works well when you're on foot and your enemy's a massive MCA mech.

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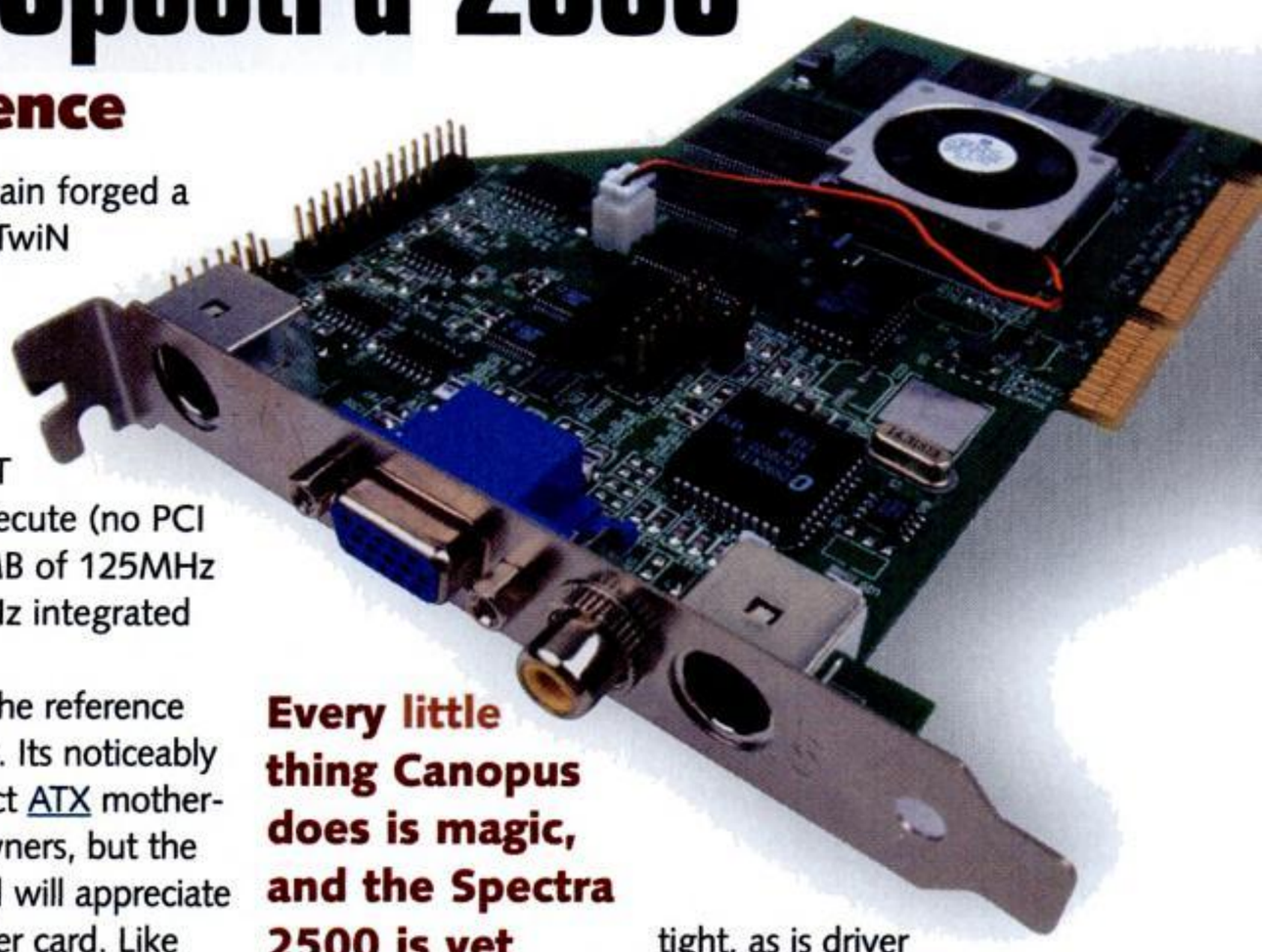
Canopus Spectra 2500

TNT par excellence



THE SPECS

MAX 24-BIT RES/REFRESH RATE
1920x1440/60Hz

MAX 16-BIT RES/REFRESH RATE
1920x1440/70Hz

VESA 2.0 COMPLIANT?
Yes

AGP?/LEVEL
Yes/2x Execute

AGP DIRECT MEMORY EXECUTION?
Yes

BUNDLE
Win95/98/NT 4 drivers | WitchDoctor Voodoo/Voodoo² drivers (required for reverse pass-through TV-output)

MAXIMUM PC KICK-ASS! product

Canopus has once again forged a masterpiece with its TwiN Texel–powered Spectra 2500 2D/3D videocard.

The Spectra follows nVidia's TNT specs to the letter—AGP 2x/execute (no PCI version will be made), and 16MB of 125MHz SDRAM coupled with a 250MHz integrated RAMDAC.

The Spectra 2500 zigs from the reference design crowd in numerous ways. Its noticeably smaller formfactor may not affect ATX motherboard owners, but the AT crowd will appreciate the smaller card. Like on its Voodoo²-armed Pure3D II card, Canopus slaps a mini fan directly over the TNT processor, so overclockers won't feel the burn.

Every little thing Canopus does is magic, and the Spectra 2500 is yet another example of how Canopus does videocards right.

One of the most powerful aspects of the Spectra 2500 is its WitchDoctor technology, which grants *any* Voodoo or Voodoo² board TV-output capability via its reverse pass-through connector and software driver technology. You feed any Voodoo board's output into the Spectra 2500, and then the 2D board can spew all the output into your favorite S-Video or composite TV input. For folks blessed with Canopus Voodoo boards, you can perform this miracle via an internal ribbon cable, thus cutting down on your computer's rat's nest of cables.

As expected, the drivers are chock-full of features, including memory overclocking (from 110MHz to 120MHz), as well as OpenGL/Direct3D toggles for anti-aliasing, etc. TV output control is tight, as is driver implementation. When engaged, the Spectra 2500 automatically sets resolution and refresh rates to a TV-friendly setting (unlike Diamond's Viper V550). Going to TV requires major gamma correction to get the hues and saturation right on, and you can save unique settings via the control panel applet. You can drive both TV and CRT simultaneously, but having the monitor hooked up will darken the TV output slightly—again, configuring the gamma and saving the settings will get your texels tussling.

The card can also hook up to Canopus's $99 Spectra VideoPORT 600, which allows Motion-JPEG video capture, audio input to your soundcard, and a Snappy-esque still-image capability.

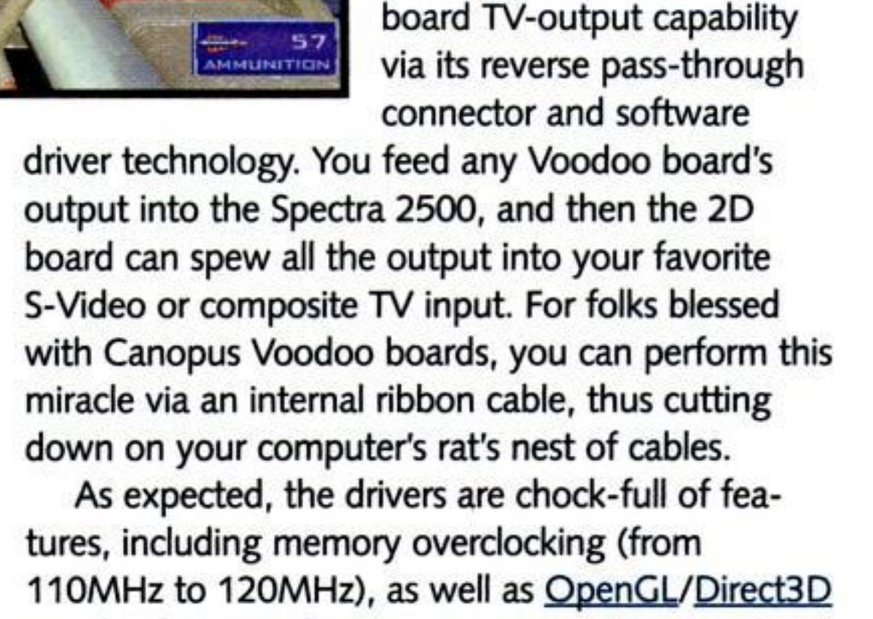
Under the gun, the Spectra 2500 performs slightly under other TNT boards we've seen. Don't get us wrong—101fps at 800x600 *Forsaken* is nothing to be ashamed of, nor is 54.2fps at 800x600 *Quake II*. Canopus opted for reliability when setting its memory speeds, resulting in the slightly lower performance. Visual quality is great, as is 2D desktop performance. But the real star of the show is the reverse pass-thru technology. We coupled a 3Dfx Voodoo² reference board with the Spectra, and after installing the WitchDoctor 2 drivers (you'll have to give up your vendor's Voodoo² drivers), TV-output was in full-effect.

In an age of me-too products and lackluster driver design, the Spectra 2500 is yet another stellar product from Canopus.

—Andrew Sanchez

PLUSES
- The fastest 2D/3D integrated solution to date
- WitchDoctor technology gives TV-output to any Voodoo/Voodoo² board
- Smaller formfactor
- Integrated fan on TNT processor
- Excellent TV control and range of TV resolutions

MINUSES
- Not as fast as dual SLI Voodoo² on GLQuake-based applications
- Performance slightly slower than other TNT offerings
- No software DVD


REAL WORLD BENCHMARKING
FORSAKEN 800x600 fps 101.7
FORSAKEN 1024x768 fps 63.9
BATTLEZONE 800x600 fps 47.7
BATTLEZONE 1024x768 fps 39.9
QUAKE II 800x600 fps 54.2
QUAKE II 1024x768 fps 34.8

NOTE: V-Sync is enabled for all results. Benchmarks were taken at the highest refresh rate the videocard would allow (>100Hz at all resolutions) to alleviate any V-Sync bottlenecks.

MAXIMUM PC VERDICT

Price $199
Company Canopus
Phone 408.954.4502
URL www.canopuscorp.com

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For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com

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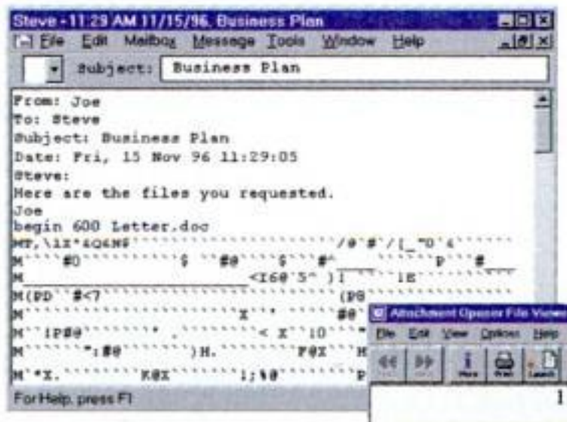

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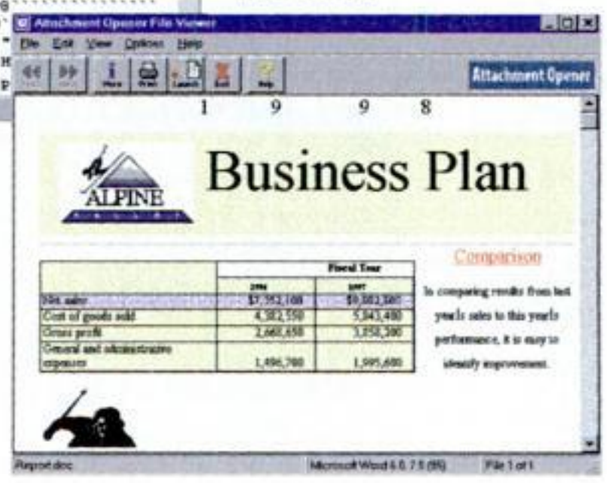

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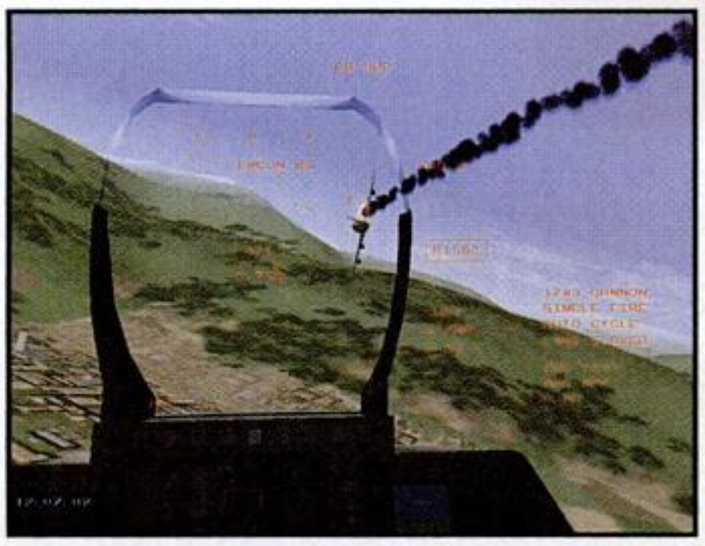
Meet The Jet Sims

It's the campaign that counts

We desktop jet-jockeys used to be satisfied with blasting into the wild blue yonder, sticking a heat-seeker where the sun don't shine, and strafing poor blighters in the trenches. However, two new air-combat simulations from Digital Image Design and I-Magic are raising the bar to include grand campaign strategy as well.

—Frank Lenk

Total Air War



Sexy camouflage, translucent cloud layers, and velvety hills make Total Air War easy on the eyes. Pervasive data read-outs make it easy to fly.

Total Air War wraps the airborne parts of *F-22 Air Dominance Fighter* (*ADF*) in a massive new campaign engine to create a multidimensional monster sim. *TAW* includes 10 new campaigns, all set in the Red Sea. It simulates an entire air and ground war for each campaign, then uses that to generate a selection of missions.

Like most fighter sims, you can just hop in the cockpit and squander expensive air-to-air and air-to-ground ordnance. But *TAW* goes the extra mile and allows you to manage the entire campaign from aboard an AWACS control plane. Using a detailed multicolor map, you can dispatch allied flights on air-patrol and intercept missions, then drop into any F-22 for first-person action.

With an infinite supply of dynamic scenarios, you probably won't miss a full mission builder. Custom Combat mode does let you set up simple nonscripted encounters, against your choice of more than 120 types of aircraft, ships, and ground vehicles.

Carried over from *ADF* is the dazzling ACMI flight recorder, which lets you review entire missions in wire-frame 3D, with colored overlays showing who shot whom and how.

Multiplayer support is extensive, offering eight-way cooperative missions via Windows DirectPlay, with match-up services promised on Mplayer, DWANGO, and WirePlay.

The well-honed *ADF* 3D engine runs at up to 800x600 in 16-bit color, using either Direct3D or Glide to display up to 2,500 polygons at a time. Terrain is up to DID's usual standards, with deeply crumpled hills and urban areas. Despite the addition of translucent cloud layers, framerates cruise up in the high teens on anything faster than a P200 with a good 3D accelerator.

The virtual cockpit is excellent, with multifunction display (MFD) panels live at all times. But there's no nonvirtual view, so access to autopilot modes and other avionics options requires switching MFDs to full-screen. Also, for a sim this massive, the noninteractive tutorial is a cruel joke.

Of course, the long learning curve and 300-page manual won't scare the target *Total Air War* customer. If you have jet fuel flowing in your veins and HUD readouts burned into your retinas, this is the sim for you.

MAXIMUM PC VERDICT

Price $50
Company Infogrames Entertainment
Phone 877.463.6472
URL www.did.com

9

iF/A-18E Carrier Strike Fighter

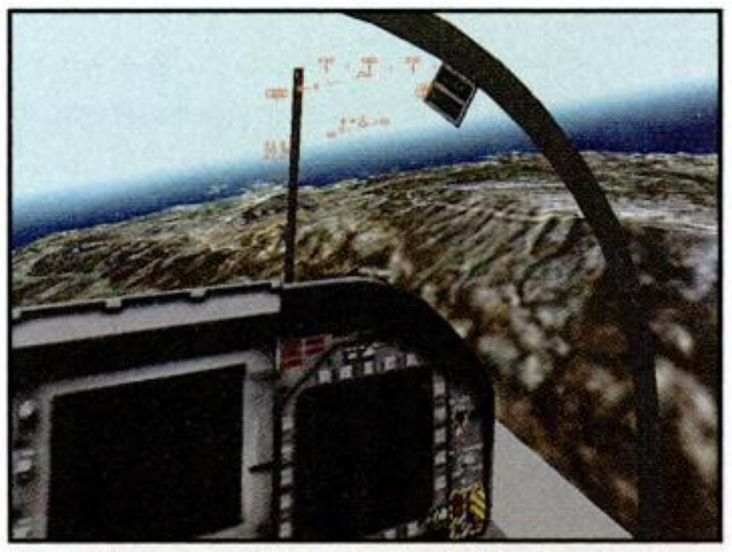
Take a quick look at *iF/A-18E* and it could be hate at first sight. Which would be too bad, because this sim conceals massive game power behind its visual trade-offs.

You'll start *iF/A-18E* with the adrenaline-rush of a catapult take-off from the U.S.S. Abraham Lincoln. You may even have time to notice the impressive aircraft exteriors, with moving control surfaces and realistic weapons load-out.

Then come the trade-offs. Although color depth is 16-bit, you'd hardly know it from the mottled blue wallpaper that passes for water. Terrain is pixelated, and the horizon is too close, masked by a translucent white haze.

But there's method in the madness. The Demon terrain engine maps about 350x230 miles of 30-meter-resolution satellite imagery onto an elevation map. This makes for lousy sight-seeing at low levels, but provides accurate navigation. And once you get up above 5,000 feet or so, it looks surprisingly sharp.

Up at altitude, flight characteristics are impeccable, with joystick response that's razor-sharp in normal flight, mushy and treacherous when you push the envelope. Drop the speed a bit in a hard turn and you can easily find yourself in a terminal flat spin. Instrumentation is equally authentic, including full air-to-air and ground-mapping radar, forward-looking infrared for night-time, and all the buttons and multifunction displays you can click a mouse at.



Mountainous Greek isles look a lot better than the dull ocean texture. The HUD stays live in virtual cockpit view, but instruments go dead.

But the real star of the show is the Talon dynamic campaign engine. *iF/A-18E* drops you into a credible scenario that evolves an infinite variety of missions, based on your performance. Crafty AI for both enemies and wingmen keeps things tense.

On a Voodoo^2-equipped Pentium II 233, framerates cruised in the 20+ range, even at 1024x768. Acceleration is via Direct3D.

The biggest disappointment is the skimpy tutorial—essentially nine basic missions with no extra in-flight assistance. Further gripes are minor: blank instrumentation in virtual cockpit view, little target detail in the mission planner, and too-easy red-outs when you invert the plane. But none detract from the hot action endlessly replayable campaigns.

With *iF/A-18E*, the Demon and Talon technologies finally get the presentation they deserve.

MAXIMUM PC VERDICT

Price $50
Company Interactive Magic
Phone 919.461.0722
URL www.imagicgames.com

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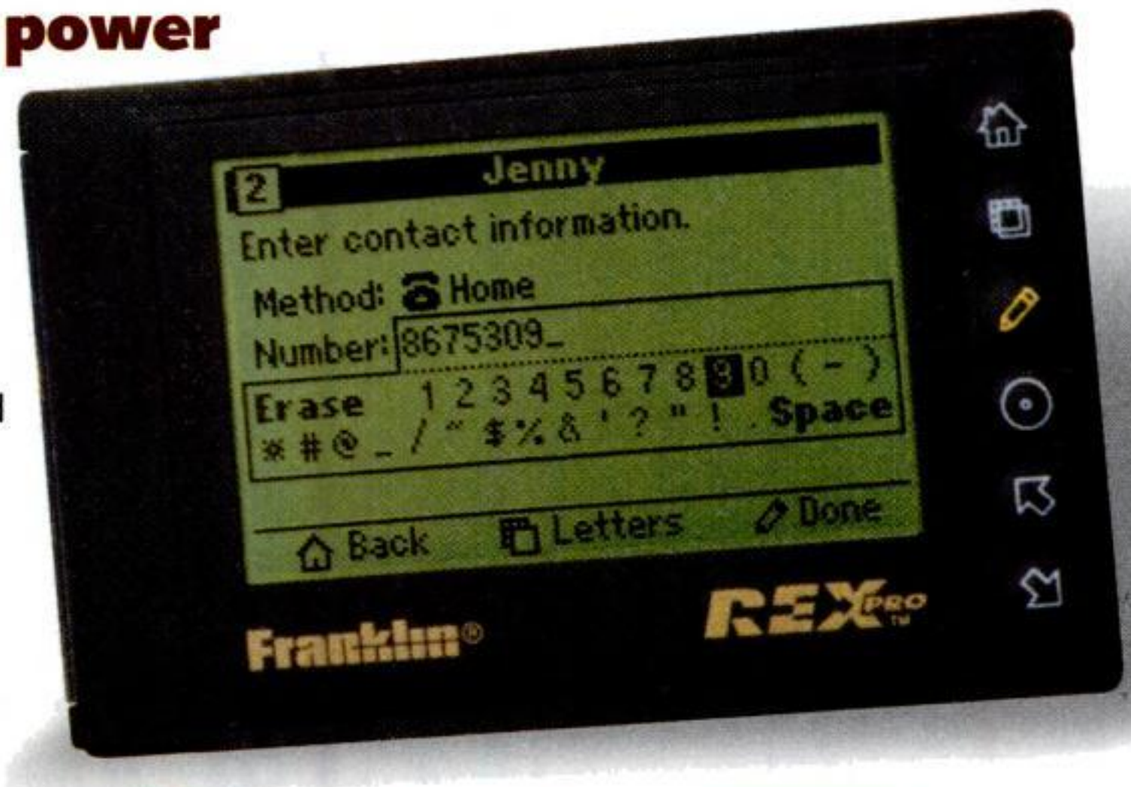
Rex Pro

Pocketable PDA power



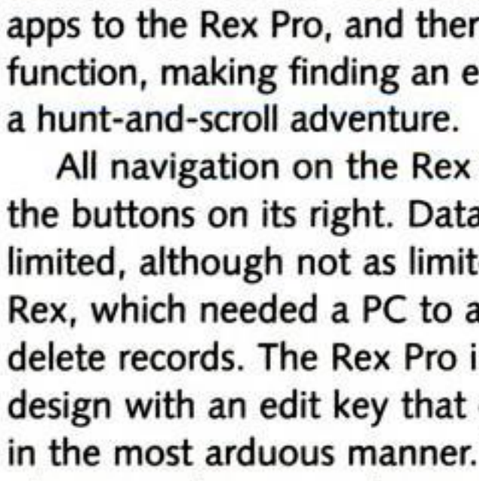
Small, light, and packed with PDA might—the Rex Pro puts all your personal data wherever you are.

In the world of PDAs, size is a religion and the tiny Rex Pro is the Holy Grail. The credit-card-sized PDA weighs in at 1.2 ounces and measures a mere .25 inches thick. Think PC card data bucket and you have a good idea of what the Rex is about. Designed as a wearable data organizer, the Rex Pro slips easily into your smallest pocket, where it remains out of sight and out of mind until you need to look up a phone number or appointment.

Certain sacrifices had to be made for this PC card organizer to wrestle in its weight class, so the Rex Pro doesn't sport the power and programmability of the Palm III. The front of the Rex Pro's metal body houses a 2.2x1.3-inch LCD screen that is neither backlit nor touch-sensitive. Six applications are hardwired into the Rex: an appointment calendar, a contact database, a memo reader, a task manager, and a home/world clock. There's no way to add new apps to the Rex Pro, and there still isn't a search function, making finding an elusive phone number a hunt-and-scroll adventure.

All navigation on the Rex Pro is done through the buttons on its right. Data entry is severely limited, although not as limited as the original Rex, which needed a PC to add, change, and delete records. The Rex Pro improves the original design with an edit key that enables data entry in the most arduous manner. To enter names, phone numbers, or notes, you must scroll through the alphabet one letter at a time and construct words in a manner similar to entering high score initials in an arcade game.

Helping you along in this task are context-sensitive wizards. Scheduling a meeting is a four-step process where you select the type of meeting, select the person to meet with from your contacts, schedule the date and time, and set a reminder. Adding a new contact is streamlined into a name-and-number affair. Addresses can be added later, but we recommend against it unless you're itching to get a thumb cramp by painstakingly selecting letters and numbers one by one.



The Rex Pro lines your palm with important contacts and appointments.

Two CR2025 3-volt button-type batteries power the Rex Pro through six months of normal use. Stocked with 512K, it holds up to 6,000 records (about 3,500 contacts) and interfaces with your PC via a serial port docking station or through one of your notebook's Type II PC card slots. PC-to-Rex data swaps are handled by Starfish Software's *TrueSync Desktop* stand-alone PIM, or *TrueSync Plus*, which directly syncs the Rex with popular PIMs such as *ACT!* and *Outlook*. Unlike the straight data dump performed by the old *TrueSync*, *TrueSync Plus* actually compares data and resolves conflicts between the Rex Pro and your PIM software. The syncing process takes a minute on average through the docking station and thirty seconds through the PC card slot.

The Rex Pro is a handy little PDA that you'll take with you wherever you go. While it's not a full-featured PDA, it packs a lot of data into a tight package and puts it all under your thumb.

—Sean Downey

THE SPECS

SCREEN RESOLUTION
160x96 black and white
RAM
512K
I/O
Type II PCMCIA connector
DIMENSIONS
3.375x2.125x.25 inches
1.2 oz without batteries
INCLUDED ACCESSORIES
Serial port docking station
BUNDLE
Starfish TrueSync Plus | TrueSync Desktop

PLUSES
- Small and light
- Simple data entry features
- Synchronizes through PC Card slot

MINUSES
- Limited data entry
- No way to add new apps

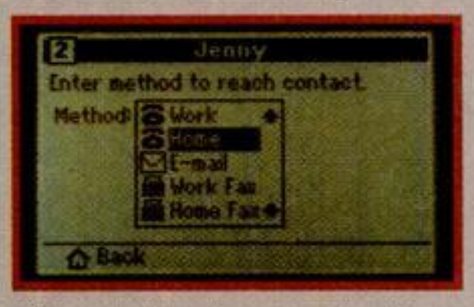
MAXIMUM PC VERDICT

Price $240
Company Franklin Electronics
Phone 888.739.6400
URL www.franklin.com

8

TAKING A NUMBER

Getting a name and number on the Rex Pro isn't quite as simple as writing it on a cocktail napkin, but it's definitely easier to find the next morning.

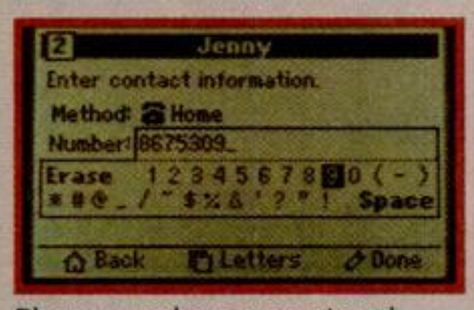


After starting the wizard with the edit key, select what kind of contact you're creating.

1
New Contact
Enter first name.
Contact: Personal Contact
First: Jenny_
Erase A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z Space
Back
Numbers
Done

Then enter the first name and last name by scrolling through and selecting letters one by one. You're given a list of categories to file the contact under so you know where to look for it later.

Next, a list of contact methods are listed ranging from home phone to web page.



Phone numbers are entered using the same scroll and select method.

The wizard supplies correct phone-number formatting for long distance and international numbers. After confirming the name and number, you can re-open the entry to add an address to the contact info.

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THE NEXT EVOLUTION

ALIENWARE

-PC Gamer, January 1998

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104-Enhanced Keyboard
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PC Power Cooling K-1 CPU Fan
128MB SDRAM (PC-100)
1.44MB 3.5" Floppy Drive
Canopus SPECTRA 2500 TNT 16MB
Canopus Pure 3D Voodoo2 12MB
Witchdoctor TV-OUT
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HARDWARE VERSUS SOFTWARE DV

There are two basic types of 1394 encoding: software and hardware. While the software solution is less expensive and is used in products such as Pinnacle Systems' DV300, DPS's Spark, and Adaptec's HotConnect 8945, hardware encoders have distinct advantages, including the ability to mix analog and digital video streams (software DV can only handle DV in/out) and speed up transition rendering. Hardware will also transcode DV to a component signal and S-Video-to-DV signal in realtime.

However, these few advantages can cost you up to $2,000 more, mainly due to the cost of the hardware codec license from Sony and the bundled software in the box.

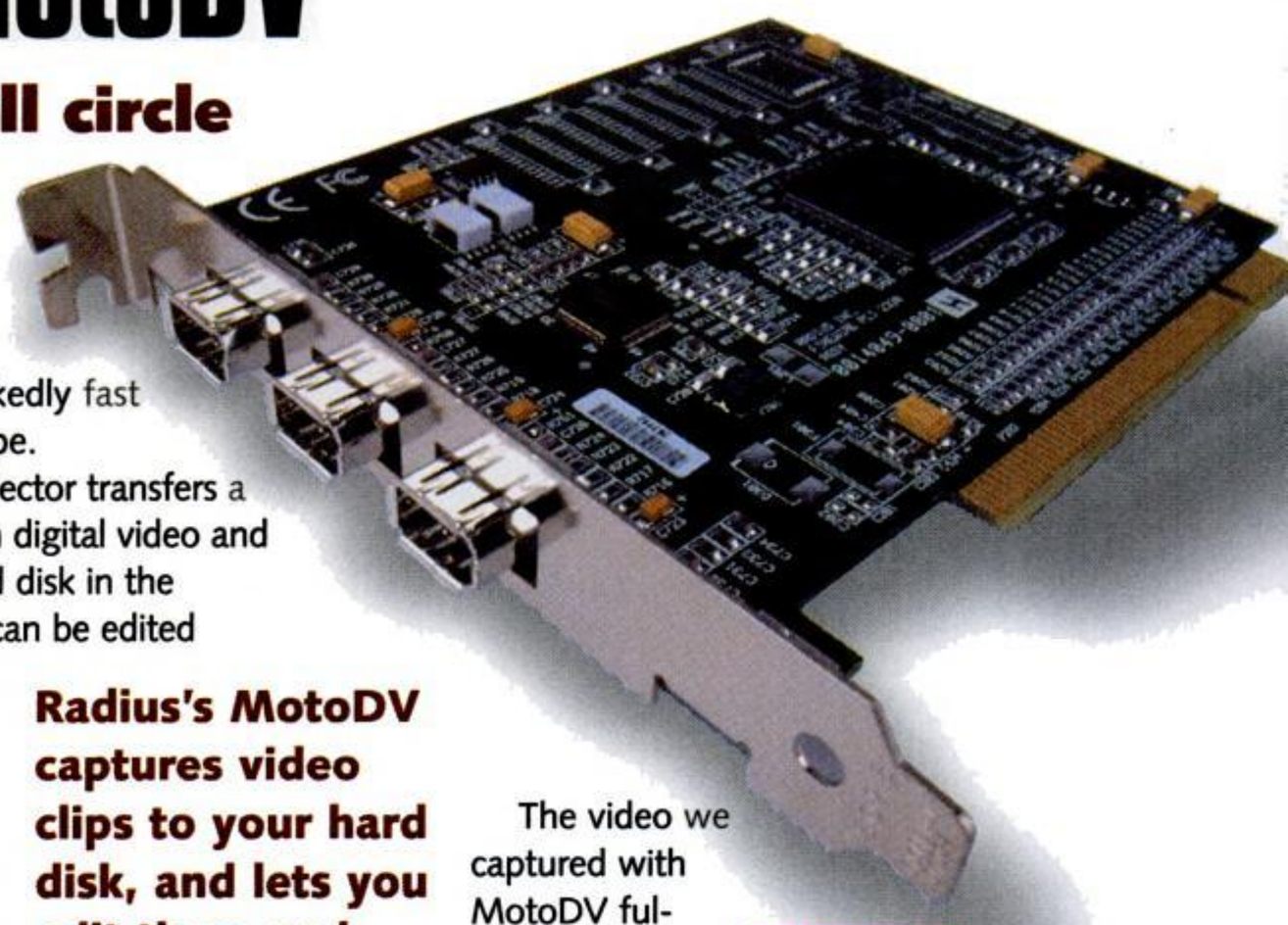
The two products in the Professional DV category are Canopus's DVRex-M1 ($2,000) and Fast Multimedia's DV Master Pro ($3,000). Both use Sony's DVBK-1 hardware DV codec.

Some of the additional features and functionality you'll see on these systems over their sub-$1,000 counterparts include breakout boxes, for attaching optional video sources such as S-Video, composite and component, realtime audio, and video scrubbing; and higher-end editing applications such as in:sync's *Speed Razor DV* (included with DV Master Pro) for long-form video editing. These features are important to DV professionals, who often have to mix media and don't have a lot of time on the clock. But, if you don't need to mix media, we suggest you apply the money you save toward a DV VCR. This saves your camera from the wear and tear it receives when you constantly use it as a VCR.

For more information on Canopus's and Fast Multimedia's products check out **www.canopuscorp.com** and **www.fastmultimedia.com**, respectively.

Radius MotoDV

Radius goes full circle



MAXIMUM PC KICK-ASS! product

MotoDV takes advantage of the converging technologies of digital video and the wickedly fast IEEE 1394 data pipe. The 1394 connector transfers a digital clone of your full-motion digital video and audio from tape directly to hard disk in the QuickTime 3.0 format so they can be edited and/or composited in third-party applications such as Adobe's *Premiere*. Because DV doesn't suffer compression, decompression, or analog/digital conversions, it retains its original quality, producing an edit master close to that of edited Betacam SP. Only transitions and effects are actually rendered by the Radius software codec and are then saved as new DV segments. The final edited video is output back to DV tape as a digital copy.

Radius's MotoDV captures video clips to your hard disk, and lets you edit them and output a finished product to tape.

When you launch MotoDV, its video-capture screen appears, complete with standard on-screen tape deck transport controls, plus forward and backward buttons for stepping frame-by-frame, clip searching, and slow motion. If you have a DV device connected and loaded with a tape, you'll also see a readout of the tape's current timecode and a still of the current frame. These controls and the timecode readout make a fast and easy job of finding and capturing the footage you want.

MotoDV also has a slider that lets you choose the performance of the preview—from faster to sharper—and provides a running report on the remaining space, the video time it represents, and the performance of your disk. It even gives you the option to capture at the 16:9 aspect ratio used in the new DTV standard. MotoDV also does time-lapse capture. You set the interval between the frames you want captured, and it generates an exceptionally smooth time-lapse movie.

DV handles audio strangely. Camcorders sample 16-bit sound as either two stereo pairs at a 32kHz sample rate (used by no other format) or as one stereo pair at 48kHz. This is a minor irritation, but via QuickTime 3.0, *Premiere 5.0* accepts either sample rate and will play it back at your choice of 32kHz, 44.1kHz, or 48kHz. You just set your playback rate and forget it.

MotoDV comes with the *Premiere* Print-to-DV plug-in, which plays your hard disk video back out through 1394 into your DV device. When it's connected to an NTSC monitor, you see a true representation of the video you're editing. The stand-alone DVplayer app will also do this.

The video we captured with MotoDV fulfilled the DV promise of excellent, broadcast-quality video and audio. Capturing was almost fun, and installation and hookup (one 1394 cable between the Radius card and a DV deck) was a breeze.

The only complaint we had was that MotoDV lacks batch capture, and the manual tries to do double duty as a Mac and Windows book, which is distracting.

Unlike Pinnacle Systems' DV300, DPS's Spark and Adaptec's HotConnect 8945, MotoDV does not include a built-in SCSI 2 card for capturing video to an A/V drive. On the other hand, you don't need an extra SCSI card if you have a UDMA IDE hard drive in your machine. UDMA drives are capable of sustaining between 8MB and 16MB of data per second, well above the 3.6MB/sec required of a digital video stream.

MotoDV is the least expensive DV capture board on the market and the best value for your money.

—Tim Tully

THE SPECS

REQUIREMENTS

- Win 95/98
- 200MHz Pentium
- PCI slot
- 64MB RAM
- 16-bit graphics capability with DirectX/DirectDraw compatible driver
- Fast SCSI or Ultra IDE AV disk
- DV deck or camcorder

PLUSES

- Easy installation
- Fast and easy video capture
- Seamless operations of 1394

MINUSES

- Lacks batch capture
- Manual could be more clear

MAXIMUM PC VERDICT

Price $499 including card and MotoDV (with Premiere 5.0: $899); PhotoDV, sold separately ($99), adds still-capture
Company Radius Inc.
Phone 650.404.6000
URL www.radius.com

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miroVIDEO DC50

It's big, it's bad, and it's broadcast quality

The DC50 finally handles component video... hurray!

Cheap can be good, and the miroVIDEO DC50 video-capture card captures video and serves as a nonlinear editing tool for creating broadcast-quality video for less than two grand.

Based on a chipset similar to the one that powered the miroVIDEO DC30+, the DC50 maintains video in 4:2:2 (component-quality) format during input, processing, and output.

With a high-quality, rack-mountable breakout box with I/O for component signals and popular video and audio formats, the DC50 compresses captured video at rates from 1MB/sec to 7MB/second, for some of the highest quality video in its price range. Pinnacle calls this 2.8:1 compression, but most people calculate the rate of raw video at 27MB/second, which puts the DC50's lowest compression at about 4:1.

The DC50's VGA overlay allows you to preview your video on a VGA monitor, and full field and frame resolutions of 720x486 NTSC and 720x576 PAL.

Pinnacle's hardware-accelerated *INSTANTVideo* app replaces *Premiere*'s rendering process with one that renders only what's necessary (transitions created since the last render, for example), and doesn't write digitized source to new AVI files, saving time and—given that it simply renders less video—disk space. And because *INSTANTVideo* can play over multiple partitions, your movies can be more than 2GB long.

Unlike competitive one-card capture solutions designed primarily for component video, the DC50 does not include LANC, 1394, or other forms of transport control for video devices. But it is compatible with third-party products that offer this function, such as the Pipeline Pro BTR.

To test the DC50's performance, we captured a five-minute talking head at various data rates, with mixed results. Using Medea's VideoRAID, a 9GB IDE RAID drive, the DC50 captured and sustained a 4.3MB/sec data rate without dropping frames or losing sync. However, it dropped 13 frames when we kicked the quality slider down to 3.5MB/sec. Capture performance is hard disk driven, so if you have a slow or fragmented hard disk, your sustainable data rates will drop. At the DC50 level, we suggest using an A/V-calibrated SCSI drive spinning at 7,200RPM.

When we played the source through *Premiere 4.2*'s capture window and an NTSC monitor, the video failed to lock up correctly about a third of the time, suffering severe color and image distortion, rolling, and other unacceptable artifacts. Simply moving the capture window usually corrected this, but occasionally we had to stop and restart tape to get sync. Definitely an annoying time-sink.

We cut the captured footage into five segments, rearranged them randomly, putting transitions and cross-faded audio between each, with fades at the beginning and end. The initial render took more than 20 minutes, but as promised, subsequent edits rendered in one to three minutes. And *INSTANTVideo* worked perfectly and maintained a consistent image quality and sync throughout. Occasionally, the clip lost sync and stuttered for a couple of seconds after playback began, forcing us to restart mastering.

Captured video had only a slight decrease in sharpness and luminance from the original tape.

Despite quirks, which can be worked around, the DC50 delivers high output quality at an unbelievable price.

—Tim Tully

THE SPECS

BREAKOUT BOX CONNECTIONS
I/O to: component (Y, R-Y, B-Y), composite, S-Video (Y/C), balanced XLR and unbalanced RCA audio, and genlock

BUNDLE
Adobe Premiere 4.2, AfterEffects 3.1

REQUIREMENTS
133MHz Pentium
32-bit PCI 2.1 bus-mastering slot
32MB RAM (64 MB recommended)
500MB of hard disk space
Ultra Wide SCSI hard drive
16-bit graphics board with DirectDraw(tm); driver for video overlay
Windows 95, Windows NT

PLUSES
- Captures broadcast-quality component video
- Fast rendering
- Great audio
- Comprehensive I/O

MINUSES
- Inconsistent playback in mastering utility
- Sometimes needs multiple starts and stops to sync with video source

MAXIMUM PC VERDICT

Price $1,999
Company Pinnacle Systems
Phone 650.237.1851
URL www.pinnaclesys.com

8

DO IT WITH THE DC50

With *After Effects*, you can create your project directly from the same video files you used in *Premiere*. When you finish the *After Effects*, save it as an AVI file with the DC50 codec, bring it into *Premiere* just as you would with any AVI video clip, and edit it into the production.

- Open a new project and import some of the AVI clips you've digitized.
- Open a Construction window and drag one of the clips onto it.
- Drag the rest of the clips onto various locations in the construction window, on and around the main clip. Using *After Effects*' timeline construction window and extensive effects selection, adjust their sizes, coloration, and shape; automate them to move around the main clip-and play back their own footage as they do.
- Render the *After Effects* project and save it as an AVI file. This can be time-intensive (and *INSTANTVideo* is no help here). But a few clips flying across a 10-second main clip shouldn't take more than an hour or so.
- When you're done, you have a cool-looking intro sequence in which the main clip plays while little versions of other clips flip, flop, and flail across it adding color, motion, and interest.

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Enter the Ultimate 3-D Upgrade Holiday Sweepstakes

This holiday season, five lucky winners will walk away with all of the gear needed to rev-up their PC for the ultimate in 3D action and sound. This year's winners will receive the following 4 products from our contest sponsors.

Sony GDM-F500 or GDM-400PS Computer Displays

Two lucky winners will receive the Multiscan F500, Sony's flagship model, introduces the very latest in advanced CRT display technology from Sony: the unique FD Trinitron CRT. Selected as the computer display of choice for Maximum PC's "Dream Machine", this virtually flat CRT minimizes geometric distortion and reduces reflective glare that may cause eyestrain. Designed with the demanding CAD and graphic professionals in mind, the Multiscan F500 redefines image performance, ease of use and reliability. This Christmas, seeing is believing, so make sure you check out Sony's GDM-F500! Three winners will take home the Sony GDM-400PS computer display incorporating the legendary Trinitron technology, now with a new flatten CRT and Sony's Enhanced Eliptical Correction System technology designed to enhance image performance.

Microsoft Digital Sound System 80

Powered by two amplifiers, the DSS80 uses a dual driver subwoofer to kick out some really deep bass and two sealed 3" satellite speakers to handle the mids and the highs. Throw in a 10-band graphic equalizer, Dolby Pro Logic, and Microsoft Surround Sound, and you've got all of the audio and digital effects you need to make the room rumble.

Aureal 3D Audio

"A3D audio by Aureal creates highly realistic and immersive 3D sound from a standard pair of stereo speakers or headphones. Originally developed for NASA, A3D uses the split-second differences between what each ear hears to re-create sounds the way they come at us in the real world: from all directions and in three dimensions. A3D works the way your ears do."

Diamond Multimedia Monster Sound MX200

Hear the full roar of jet engines, the crunch of approaching footsteps, the angry growl of alien beasts. Monster Sound immerses you in heart-pounding sound and puts you in the middle of the action. Load your weapons with Monster Sound for the ultimate 3D gaming experience... so realistic you may feel the urge to duck.

Creative Labs Graphics Blaster Riva TNT

The Graphics Blaster Riva TNT provides uncompromising 2D/3D graphics performance based on the nVIDIATM processor. It delivers incredible visual quality in colors, textures and resolutions up to 1920x1200, making it the perfect platform for power users, gamers, and graphic designers. As with all Creative products, you are ensured ease of installation, compatibility, superior quality, high performance, and award-winning customer support.

nVIDIA RIVA TNT

The RIVA TNT architecture is the first integrated, 128-bit 3D Processor that processes 2 pixels-per-clock cycle which enables single-pass multi-texturing and delivers a mind-blowing 190 million pixels per second fill rate. RIVA TNT's (twin-texel) 32-bit color pipeline, 24-bit Z, 8-bit stencil buffer and per-pixel precision delivers unsurpassed quality and performance allowing developers to write standards based applications with stunning visual effects and realism.

You can't win if you don't enter.

All you need to do is visit the maximumpcmag.com web site, look for the Ultimate 3D Upgrade Holiday Sweepstakes banner, and register to win. Don't miss out, enter today, opportunities like this don't happen every day.

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FD Trinitron

CREATIVE

DIAMOND

NVIDIA RIVA TNT

AUREAL

STB

Microsoft

VELOCITY 4400

Graphics BLASTER RIVA TNT

3D

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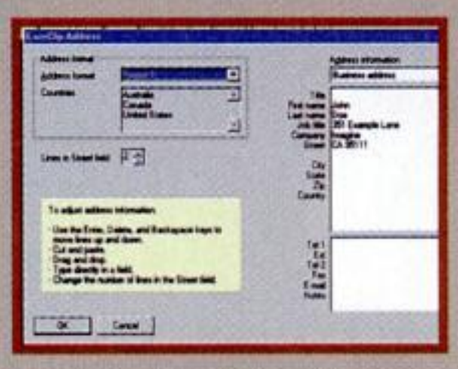
EASYCLIPPIN'

You can never have enough memory. Between your virtual pets, your word processor, your web browser, and your copy of *Diablo*, you barely have enough room for your PIM.

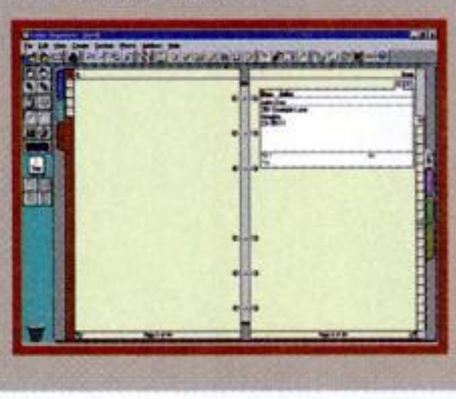
Lotus feels your pain, so they created EasyClip, which lets you gather bits of information to be added to *Organizer* later on. Here's how you do it.

Launch EasyClip (it can be set to load when your computer boots, so it might be running already). It'll look like a white book with a blue arrow on it in your system tray.

Whenever you find information you want to store in *Organizer* later, highlight it, then click on the EasyClip icon. You can create an appointment, task, address, or *Organizer* page. Choose how you want to save your content and you'll get a screen to set up details. Here's what the address screen looks like:



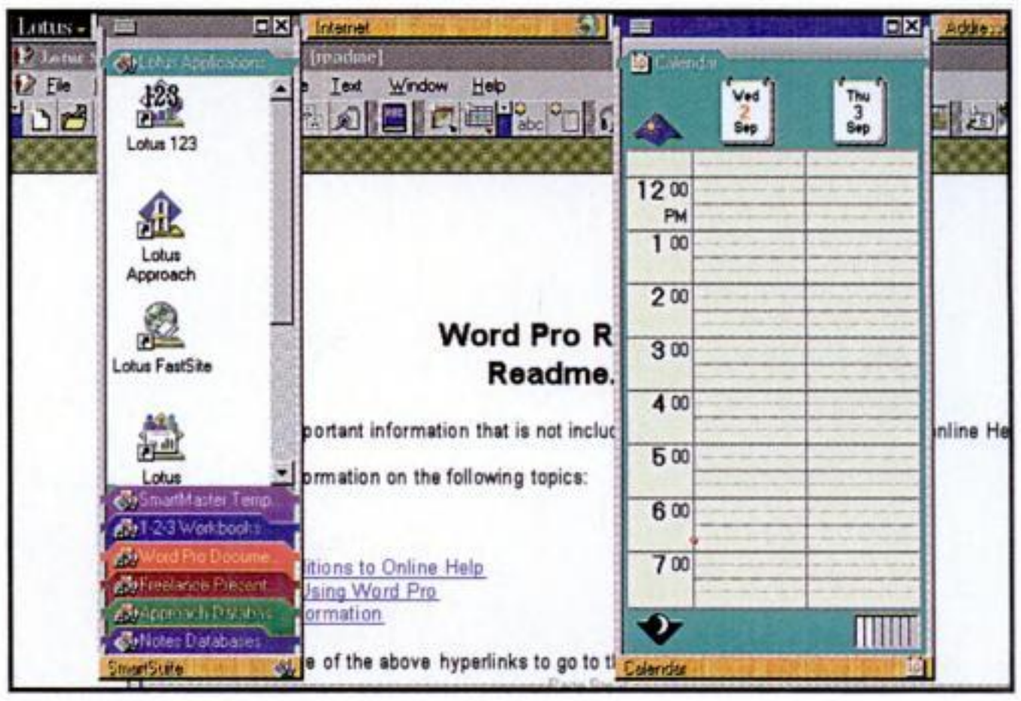
Once you have the address captured the way you like, click OK. EasyClip will save the address and it'll be available the next time you open *Organizer*.



SmartSuite Millennium

This Lotus comes up smelling like a rose

Despite Microsoft's continuing domination in the field of software suites, competitors continually dish up rival products. Lotus offers *SmartSuite Millennium*, which beautifully integrates database and organization tools, including *Word Pro*, *Lotus 1-2-3*, *Approach* (database), *Freelance* (presentation software), *Organizer* (PIM), and *FastSite* (web creation software). Lotus *Mail* is also included on a separate CD-ROM.



Lotus's SmartCenter makes applications and other information available within a few clicks.

The SmartCenter toolbar links you to applications, templates, the Internet, a notepad, and a calendar. The templates run the gamut from marketing plans to home budgets to web pages to loan amortizations. SmartCenter puts Lotus's applications within easy reach, though the tiny icons make it confusing as to which templates are associated with which applications. Program icons are also placed in the system tray, so running the SmartCenter isn't required. The toolbar made *SmartSuite* more accessible than *Corel WordPerfect*, which relies on the start menu and the system tray.

THE SPECS

REQUIREMENTS

- 486 or higher CPU
- Windows 95, 98, or NT 4.0
- 8MB RAM (16MB for Windows NT)
- 12MB of hard disk space

Word Pro takes getting used to. Font selection, for example, is at the bottom of the screen, and the layout view contains a confusing amount of white space. Once the graphic frames are understood, though, placing graphics within documents is easy. (We learned the frame-lore quickly, partially because *SmartSuite* comes with a *Lotus SmartSuite Millennium Edition for Dummies* book). *Word Pro* also integrates IBM's *ViaVoice*. Like other speech-recognition programs, you have to set up your user profile so it will know your voice. Once *ViaVoice* was properly calibrated, it worked fairly well. *Word Pro* and the other *SmartSuite* applications offer a variety of import and export filters. (*Word Pro* imports everything from *PeachText* to *FrameMaker*, and exports into the same range of formats.) Overall, we preferred *WordPerfect*, which we found easier to use and more user-friendly.

Lotus *SmartSuite* offers a set of features called Team Computing, for sharing documents via notes, the Internet, network, or sneaker net. Team functions include Team Consolidate, which lets you combine several documents and different review edits, and *TeamMail*, for e-mail attachments.

Create Site - Web SmartMaster Look
A Web SmartMaster look controls design and navigational elements at the top and bottom of every page in the site, as well as the look of the home/section pages. It does not affect the look of the individual documents.
Bookeal
Oldtime
Shiny black navigator buttons on a textured gray background.
More Looks...
Sample Section Page Title
Sample Page Description
Sample Item
Cancel
Help
< Back
Next >
Done

FastSite makes site design easy for the novice web wrangler.

Lotus's strong built-in network is a definite advantage.

Lotus 1-2-3 spreadsheet works smoothly, and *Freelance* offers several interesting templates and easy-to-learn drawing tools, including point-and-click shape making, templates for brainstorming sessions and marketing presentations, and a variety of clip art.

We had an especially good time with *Approach*, an excellent, easy-to-use database with templates for everything from meeting rooms to music to URLs. We also liked Lotus *Organizer*, which looks like a paper day planner and imports information from other programs, such as *dBASE* and *FoxPro*. It also has a nifty feature called EasyClip, which clips information for *Organizer* when it's not running.

While it's not going to win any design awards, Lotus *FastSite* lets you design and build web sites. Several layout types are available, and it's simple to import various file types into the easy-to-use, outline-like site structure.

Lotus *SmartSuite* has a lot to offer, especially for network users. The extras might be too intimidating for casual users who aren't part of a network, and the price might be too high as well. But power users will find a lot to work with in this toolbox.

—Tara Calishain

PLUSES

- Excellent organizer
- A ton of applications
- Wide variety of templates

MINUSES

- Network features useless for solo users
- Overkill for the basic user

MAXIMUM PC VERDICT

Price $472
Company Lotus Development
Phone 617.577.8500
URL www.lotus.com

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WordPerfect Suite 8

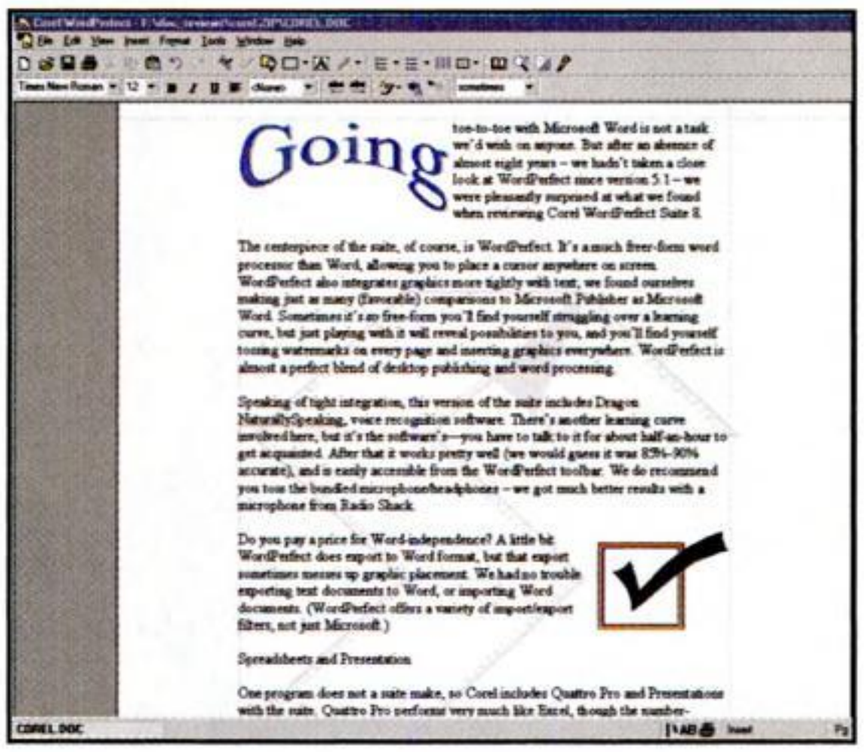
A suite alternative to MS Office

MAXIMUM PC KICK ASS! product

Going toe-to-toe with Microsoft *Word* is not a task we'd wish on anyone. But after not using *WordPerfect* for almost eight years—we hadn't taken a close look at it since version 5.1—we were pleasantly surprised at what we found in Corel *WordPerfect Suite 8*.

The centerpiece of the suite, of course, is *WordPerfect*, a much more flexible word processor than *Word*. *WordPerfect* is an almost perfect blend of desktop publishing and word processing, with extensive text-art options and a variety of page options, from watermarks to shadow cursors. It allows you to place a cursor anywhere in the document once you've opened a new one. It also integrates graphics more tightly with text by allowing free-form placement; we found ourselves making just as many (favorable) comparisons to Microsoft Publisher as to *Word*. Sometimes *WordPerfect* can be so free-form you'll find yourself confused. But you'll find yourself enjoying the possibilities. You'll toss watermarks on every page and insert graphics everywhere.

Speaking of tight integration, this version of the suite includes *Dragon NaturallySpeaking* voice-recognition software. There's another learning curve involved here, but it's the software's—you have to talk to it for about a half-hour for the application to get acquainted with your voice, after which you'll get about 85% to 90% accuracy.


Going
toe-to-toe with Microsoft Word is not a task we'd wish on anyone. But after an absence of almost eight years – we hadn't taken a close look at WordPerfect since version 5.1 – we were pleasantly surprised at what we found when reviewing Corel WordPerfect Suite 8.
The centerpiece of the suite, of course, is WordPerfect. It's a much freer-form word processor than Word, allowing you to place a cursor anywhere on screen. WordPerfect also integrates graphics more tightly with text; we found ourselves making just as many (favorable) comparisons to Microsoft Publisher as Microsoft Word. Sometimes it's so free-form you'll find yourself struggling over a learning curve, but just playing with it will reveal possibilities to you, and you'll find yourself tossing watermarks on every page and inserting graphics everywhere. WordPerfect is almost a perfect blend of desktop publishing and word processing.
Speaking of tight integration, this version of the suite includes Dragon NaturallySpeaking, voice recognition software. There's another learning curve involved here, but it's the software's—you have to talk to it for about half-an-hour to get acquainted. After that it works pretty well (we would guess it was 85%-90% accurate), and is easily accessible from the WordPerfect toolbar. We do recommend you toss the bundled microphone/headphones – we got much better results with a microphone from Radio Shack.
Do you pay a price for Word-independence? A little bit. WordPerfect does export to Word format, but that export sometimes messes up graphic placement. We had no trouble exporting text documents to Word, or importing Word documents. (WordPerfect offers a variety of import/export filters, not just Microsoft.)
Spreadsheets and Presentations
One program does not a suite make, so Corel includes Quattro Pro and Presentations with the suite. Quattro Pro performs very much like Excel, though the number-
CORELDOC

Flexible graphics placement and text-wrap options make WordPerfect a veritable desktop publisher.

You do pay a small price for *Word* independence, in that exporting a graphics-laden *WordPerfect* document to *Word* sometimes screws up graphics placement. We had no trouble exporting text documents to *Word* or importing *Word* documents because *WordPerfect* offers a variety of import/ export filters, including RTF, *Ami Pro*, and regular ASCII text.

The Corel suite also includes *Quattro Pro* and *Presentations*. *Quattro Pro* performs much like *Excel* and can import *Excel* spreadsheets up to *Excel 97*. We found it easy to create charts and integrate them into the basic cell spreadsheets, format cells, and set up calculations. *Presentations* is slide-show/presentation-creation software. The static presentation tools (for creating drawings, posters, and charts) are helpful. The slide-show outline, which is separate from the slide editor, made it easy to play with the slide transition tools without getting completely distracted. *Presentations* exports files to a variety of formats such as *WordPerfect* Graphics and Windows Metafile, including graphic formats such as GIF and JPG.

Calculating in Cells
Tip
You can type numbers in cells for simple math calculations (2+2), or you can enter cell references and create formulas.
To add, subtract, multiply, and divide, simply type the numbers and math operators in the cell, then press Enter.
For example, type 4+4 to get 8 or 4*4 to get 16.
When you type the / symbol (divide), Corel Quattro Pro assumes you are typing a date. If it looks like a date. To divide a number that looks like a date, type = in front of the number (=4/4 equals 1).
More Help on
READY

Quattro Pro provides calculating help without overwhelming the novice number cruncher.

Additional extras in the Corel suite include, *Barista*, which lets you create documents that can be viewed from Java-enabled browers; *BitStream Font Navigator*, an excellent font-management utility that made it easy for us to cull the unused fonts on our system; and *CorelCENTRAL*, a basic PIM that integrates with the core Corel suite functions, but doesn't really impress us like Lotus's *Organizer* does.

Corel's suite doesn't give any ground in its competition with Microsoft *Office*. In fact, it emerges as a strong contender. If you're willing to wander off the beaten path and explore a new way of word processing, where placing graphics and working with layout is flat-out easy, you'll find yourself rewarded.

—Tara Calishain

PLUSES
- Incredibly flexible word processor
- Easy-to-use presentation software
- Good price for what you get

MINUSES
- A minimum of network/team support
- WordPerfect takes getting used to before it's appreciated

THE SPECS

REQUIREMENTS
- Windows 95 or NT 4.0
- 133MHz Pentium
- 48MB RAM for Windows 95 (64 MB RAM for Windows NT)
- 110MB hard disk space

DARE TO COMPARE

COMPANY PRODUCT	COREL WORDPERFECT SUITE 8	LOTUS SMARTSUITE MILLENNIUM	MICROSOFT OFFICE 98
Speech recognition capabilities	Yes	Yes	No
Internet HTML publishing	Yes	Yes	Yes
Spread sheet application	Yes	Yes	Yes
Word processor	Yes	Yes	Yes
Internet Java publishing	Yes	No	No
Fonts manager	Yes	No	No
Presentation software	Yes	Yes	Yes
Relational database	Yes*	Yes	Yes
PIM/contacts/e-mail	Yes	Yes	Yes
Planning calendar	Yes	Yes	Yes
Budgeting software	Yes	No	Yes**

*= WordPerfect Suite Pro Edition; **= Small Business Edition

MAXIMUM PC VERDICT

Price $425
Company Corel
Phone 800.772.6735
URL www.corel.com

9

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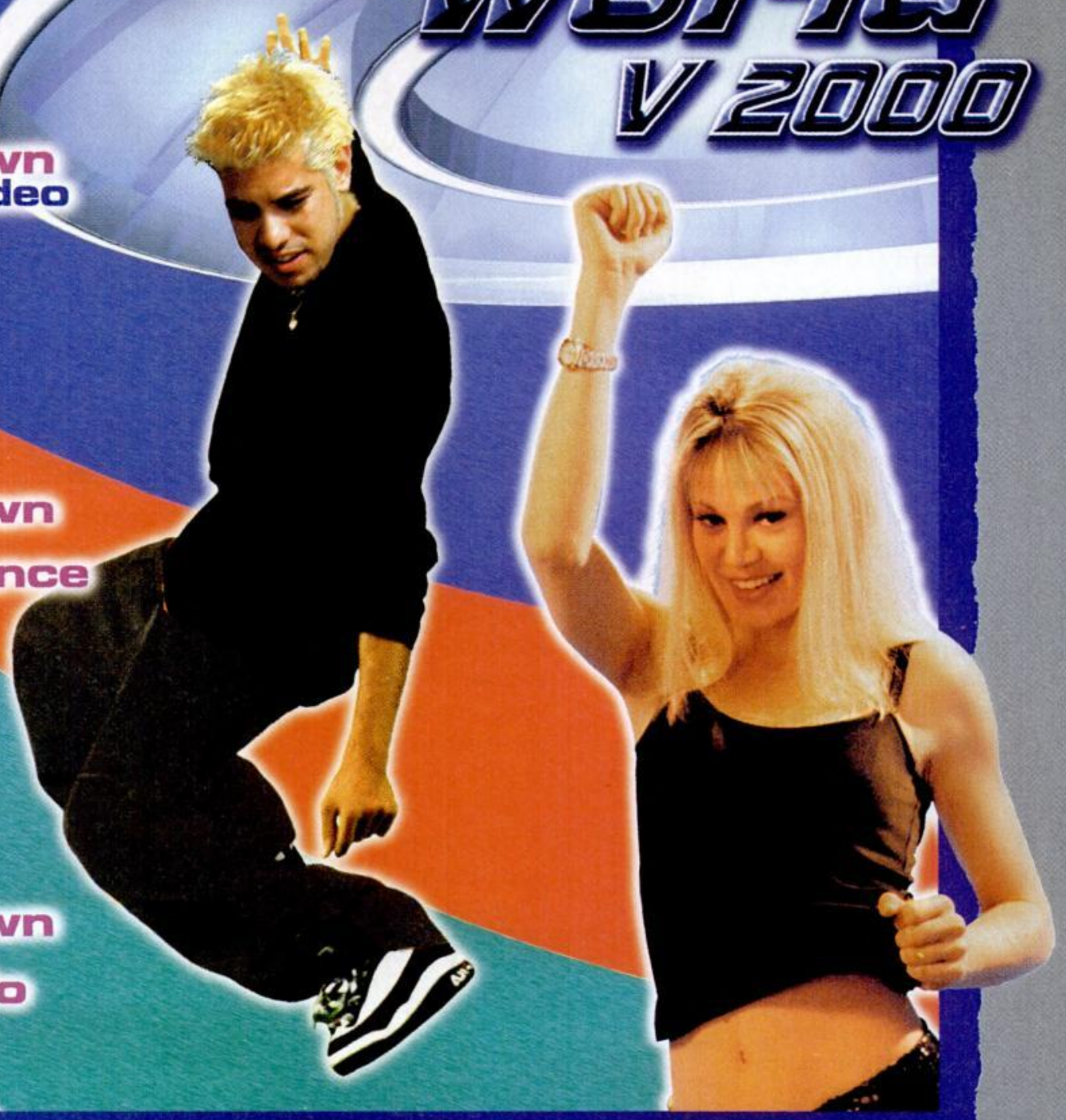

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Real-Time Strategy Games

The games remain the same

Looking at the glut of realtime strategy (RTS) games, you'd think latecomers would introduce new and distinctive elements.

Unfortunately, RTS developers are suffering from a bout of lazy eye. After firing up the current crop of RTS games, we found none of the following titles dish up anything we haven't seen before.

—Frank Lenk

M.A.X. 2

In this month's pool of mediocrity, *M.A.X. 2* rises above the rest. It doesn't break new technical ground, but has more of what you're looking for, such as 22 structures to build; 35 types of air, sea, and land units; multiple viewing modes; and detailed control options.

Turn on the grid and right-click to show the unit menu: it may look cluttered, but it works.

M.A.X. 2 feels like its own beast, rather than another *Command & Conquer* clone. It's about the only game of this type to forgo the usual tile-based map in favor of a fully rendered map image that can be tilted by up to 60 degrees in a simulated 3D perspective. Terrain is dark and grainy, but has a unique style.

For variety, *M.A.X. 2* includes realtime, turn-based, or simultaneous-move modes. The game supports up to six players, and a unique "hot seat" mode.

Problems with M.A.X. 2 include random computer crashes and scenarios that couldn't be completed. Interplay has released patches to fix some of these, but one problem not likely to be addressed is the inherent difficulty of distinguishing units. You have to turn on an irksome colored glow to differentiate between the troops. More disturbing is that shift-clicking on successive friendly units to add them to a group is often disastrously read as a simple click, and your troops attack each other. Sadly, these technical problems undermine an otherwise strong game.

MAXIMUM PC VERDICT

Price $50
Developer Flat Cat
Publisher Interplay Productions
Phone 949.553.6655
URL www.interplay.com

6

Dominion

Dominion is based on last year's terrible *G-NOME*. *Dominion* isn't half-bad, but coming as the first release from the highly hyped, self-indulgent Ion Storm, it's disappointingly unoriginal. Absolutely everything about *Dominion* is all-too-familiar.

You know you're grasping at straws when the coolest feature is support for higher display resolutions. And even then, you'll need serious hardware. At 1280x1024 on a Pentium II 233 and an AGP-based ATI All-in-Wonder Pro, gameplay was unacceptably choppy, with framerates in the low teens. Kicking graphics down to 1024x768 was a passable compromise.

Scenery and unit graphics are posh, reminiscent of *Age of Empires*. Unit controls are reasonably complete, with the usual grouping functions, movement waypoints, and hold-position commands. But there's sloppiness around the edges. For instance, the docs suggest setting all structures to auto-repair—so why isn't that the default?

Terrain and explosion effects look good. The bins at the bottom access building options.

Also, friendly AI is stunted—units are infuriatingly likely to take the longest possible route between two points, or throw their lives away in spontaneous suicide attacks when a new enemy is sighted. Enemy AI isn't all bad, though, and will launch moderately well-coordinated assaults.

Dominion is entertaining, but doesn't do anything that hasn't been done better in other games.

MAXIMUM PC VERDICT

Price $50
Developer Ion Storm
Publisher Eidos Interactive
Phone 214.953.0101
URL www.ionstorm.com

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WarGames

You'll get a pretty face but limited brainpower with *WarGames*. While the 3D-battlefield view pushes about 4,000 polygons, and jazzed-up environmental effects include spiffy translucent fog and vividly realistic explosions, the strategic implementations leave something to be desired.

Three teams concentrate firepower. Translucent fog shows unexplored areas.

In familiar realtime strategy fashion, you control either NORAD or WOPR forces. As in Bungie's *Myth*, you can rotate the view and watch your units going over hills and behind buildings. Unlike *Myth*, however, *WarGames* makes little tactical use of terrain. You can use line-of-sight to plan ambushes, but troops waft through trees like they aren't there, and high ground or other obstacles are almost useless, owing to the lack of detailed troop commands. You can't make units hold their ground to take advantage of ranged fire, and there are no waypoints. Action tends to devolve to a kind of arcade-game free-for-all, like *Robotron* for the 90s, mitigated only by the huge variety of units and buildings available—about 45 per side.

That and the moderately energetic computer AI makes *WarGames* mildly amusing, in the same way as Windows' Solitaire.

MAXIMUM PC VERDICT

Price $45
Developer Interactive Studios
Publisher MGM Interactive
Phone 800.586.2021
URL www.mgminteractive.com

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Klingon Honor Guard

This game is without honor

Star Trek—the kiss of death for so many games—plants a big wet one on the Unreal engine with *Klingon Honor Guard*, a first-person jaunt that's as appealing as licking a tribble.

Microprose must have beat the Unreal engine with an ugly stick, because *Klingon Honor Guard* has some of the worst graphics seen in a texture-mapped polygon shooter, despite 3Dfx and PowerVR support. None of the levels evoke the grandiose breadth and scope of *Jedi Knight* or *Unreal*. Many of the hallways and rooms are too dark, and when they are lit, repetitious low-res textures greet your pupils. Framerates range greatly depending on system configuration and situation. At 1024x768, expect anywhere from 20fps to 60fps with a 350MHz Pentium II and dual-Voodoo^2 SLI. But running smooth ain't worth spit if all your enemies move like robots.

Those Andorians are in a world of hurt, as is Microprose's frightfully bad Klingon Honor Guard.

Most of the humanoid adversaries fight with the exact same keyframed movement. Silly attack spins and simple run animation result in these folks moving like marionettes. Anyone hear of motion-capture? Visual special effects are few and far between—reflective floors, colored lighting effects, and fractal fire? *Unreal* did them better. One of the worst visual offenders is the weapon you lug around. Ultra-low-res textures and a limited color palette result in drab brown Trilithium rocket launchers having a blocky, unfiltered look about them. Monsters are a low polygon-count breed, resulting in boxy fishes and rectangular attack beasts that look more comical than scary. Frequent use of low texture-map resolution brushes for scenic detail such as ladders only heightens the cheesiness. Other problems abound, from the hacked-on CGI cinematics, to clipping problems and ridiculous death animations.

Who said anything about fair play? Expect these types of polygon encounters during your misadventures.

Show this old Klingon just what time it really is!

The saddest thing about *Klingon Honor Guard* is that it's not fun to play. Once you acclimate to the new dual-mode weapons, gameplay devolves into running around darkened corridors and killing everything in sight. That was fine in the days of *Wolfenstein 3D*, but we're living in a world of all-immersive, first-person action/adventure games such as *Half-Life*, and *Klingon Honor Guard*'s half-baked missions aren't up to snuff. Wanna impress us? Use the in-game engine to tell the story. Immerse the player à la *Half-Life* and don't have every entity on screen be a hostile target. Interact with other Klingons to help move the story along.

Multiplayer mayhem (via bots, IPX, or TCP/IP), while not as dodgy as *Unreal*, is boring and unappetizing.

Cool aspects, such as enemies having to reload weapons and the user installable surveillance cameras, are lost in *Klingon Honor Guard*'s unappealing graphics and unimpressive gameplay. Hmmm, that tribble may not be so bad after all...

—Andrew Sanchez

PLUSES
- Uses the Unreal engine

MINUSES
- Boring levels
- Blocky graphics for weapons
- Cheesy movement animations
- Boring gameplay—been there, shot that
- CGI cinematics are hacked on
- Low polygon creatures look like boxes
- Uninspiring multiplayer action
- One-player gaming experience uninvolving

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OPTIMIZING YOUR KLINGON EXPERIENCE

Still bent on getting physical with those wacky Klingons? Here are some system-tuning tips to ensure your stay in Star Trek space is comfortable.

- Get lots of system RAM: The Unreal engine is a resource hog! Unless you want to turn down almost all your settings, your best bet is to make sure you have enough system memory to head off any virtual hard drive usage, which results in framerates bogging down. 64MB is the bare minimum.
- Get a 3D card: The best configuration for hi-res *Klingon Honor Guard* action is still the venerated dual-12MB-Voodoo^2-SLI configuration. Couple this with AMD's K6-2 or a fast Pentium II, and your gameplay will be smooth as a baby's bottom. PowerVR is also available, but it's not as fast.
- Bite the bullet: If you don't pony up for any of the above options, you'll just have to ease up on the graphic options in order to get adequate framerates. Drop the resolution down from 640x480 to 512x384, and see how that works for you. You may also want to play with lowering the sound sampling rate and adjusting visual effects for even more performance.

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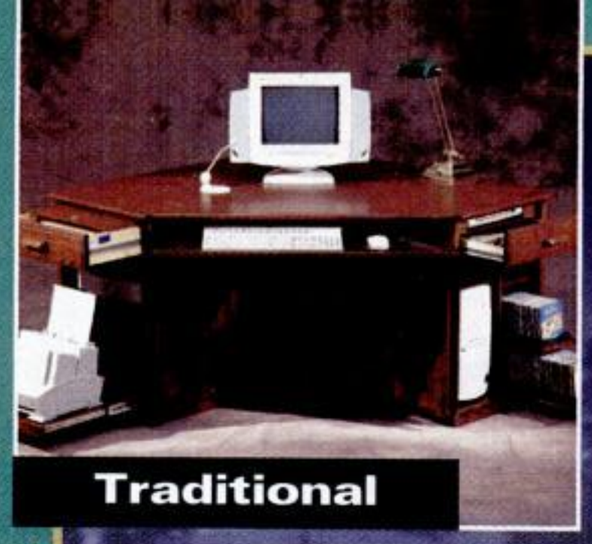

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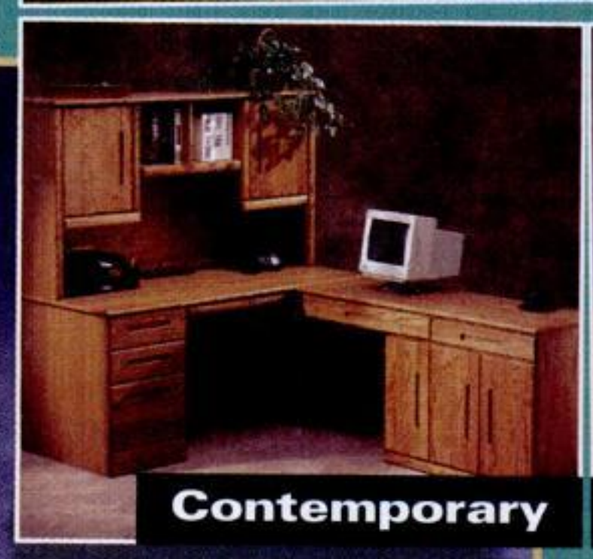

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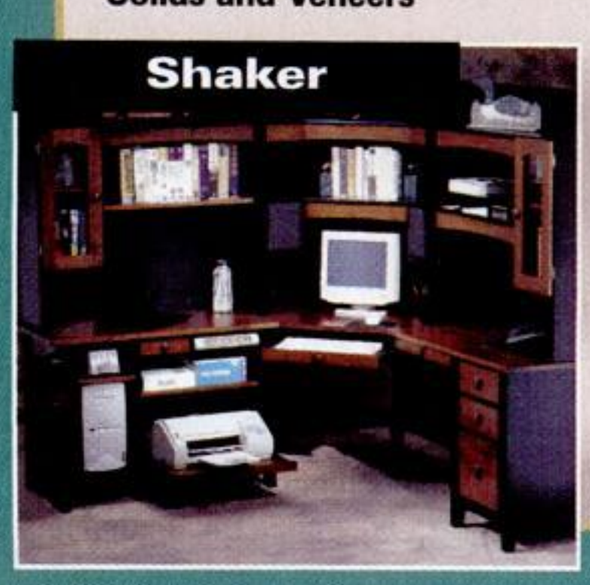

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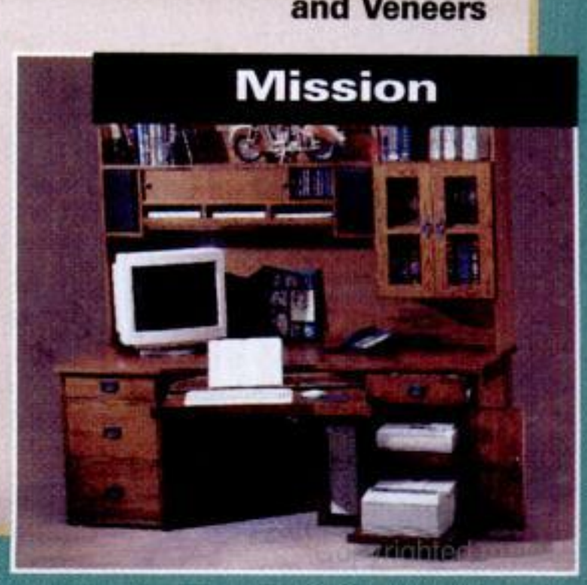

Mission

MobilePro 750c

Bigger is better—for CE units

NEC's MobilePro 750c and actor George Clooney are a lot alike. Clooney's too big for television, but not gifted enough to make it in feature films. Likewise, the MobilePro is too large to be classified as a handheld PC and not powerful enough to carry it as a mini-sub-notebook.

The 750c is based on Microsoft's Windows CE 2.0 OS. The Start button is there, as are the Microsoft-blue desktop and "Pocket" versions of *PowerPoint*, *Word*, *Excel*, and *Internet Explorer*.

Word, *Excel*, and *IE* have just enough functionality to keep most mobile users happy, but *PowerPoint* only allows playback of presentations. If you need to fix a boo-boo in a presentation on the road, you'll have to find a real computer to plug into and download your presentation. A VGA-output port lets you view presentations externally, but its limited color palette of 256 means you won't get color-fade backgrounds.

Connectivity to e-mail is handled through POP3, Pocket *Outlook*, and an internal 33.6K modem. Browsing with Pocket *IE* is satisfying, especially when you can click on hyperlinks by touching the screen with the stylus or your fingertip.

Microsoft did some of its homework in syncing *Word*, *Excel*, and *PowerPoint* to CE. Drag a file—provided it's in Office format—and the file is converted for use on the MobilePro. A warning is given if information is truncated or lost. Nothing was lost in converting a graphics-laden *Word 97* file to *Pocket Word*, but a fairly rudimentary spreadsheet in *Excel 97* lost enough values to render it useless.

Files also seem to become bloated when transferred to the MobilePro. A 135K graphics-heavy *PowerPoint* presentation on the Windows 98 client side turned into 676K file once transferred. A *Word 97* file with a large embedded graphic nearly doubled from 191K to 340K. Oddly, a graphic-less *Excel* spreadsheet shrunk from 56K to 24K. The lesson here is that you may need more RAM than you expected. You'll have to allocate almost half of your 16MB just to run CE. Another 16MB can be added by the user, and the MobilePro accepts both PCMCIA Type II and CF-2 cards.

You certainly can't tuck it into your breast pocket or purse, but the MobilePro fills the bill for any serious communicating.

NEC's claim that the lithium ion battery will give you eight hours of use was right on. We consistently hit eight hours on a charge, even when synchronizing and constantly switching the backlighting to high.

The keyboard is the most important feature of the MobilePro. Users will welcome it over useless Chiclets keyboards, but it'll take a few strokes to get used to the compact keys. They're close to an Apple Newton's, but much larger than Toshiba's original Libretto keyboard.

For clamshell CE units, the MobilePro has the most potential, but its future is fuzzy in a world where full-featured Windows 9X machines approach its size and weight. You must recognize its and Windows CE's limitations. It won't stand alone, and it'll take time for applications to trickle down. But its light weight and reliance on solid-state storage give it an edge in durability and portability even over the smallest mini-sub-notebooks.

Like Clooney, the MobilePro is an acquired taste. Recognize its limitations and it'll do wonders for you. If you expect full-featured computing or full-featured acting, the MobilePro and Clooney will leave you hanging.

—Gordon Ung

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Biography ▶

Rick Stevens is an independent multimedia developer and principle of Wordcrafted Media in San Francisco. His firm provides PC-based marketing, training, and communications presentations to propel business clients into the global village economy of the 21st century.

Tara Calishain has been working with computers since she was 16. Now 29, she has authored and co-authored several books on computers and the Internet, including *Official Netscape Guide to Internet Research and Official Netscape Guide to Communicator Professional Edition*. Her articles have appeared in a variety of magazines and web sites, including *HomePC*, *InternetWorld*, and on CINET's Gamecenter. She is the owner of CopperSky Writing and Research.

Tim Tully is a contributing writer for *Videography, EQ, Interactivity*, and the *New York Times*, and is a producer/partner in Wild Dog Productions, an independent Menlo Park-based production company that specializes in video, music, and web design. He's also authored two books, *The Audible PC* and *MIDI for the Professional*.

Frank Lenk is a licensed pilot and has logged hundreds of hours on both powered aircraft and sailplanes. Educated as a mechanical engineer, Frank built his first computer (an Apple II clone) about 15 years ago and has worked exclusively in computer journalism ever since. Currently, Frank is games columnist for the *Toronto Globe & Mail*, Canada's largest and most respected daily newspaper, and games editor for *We Compute*, the highest-circulation computer-store tabloid in the greater Toronto area.

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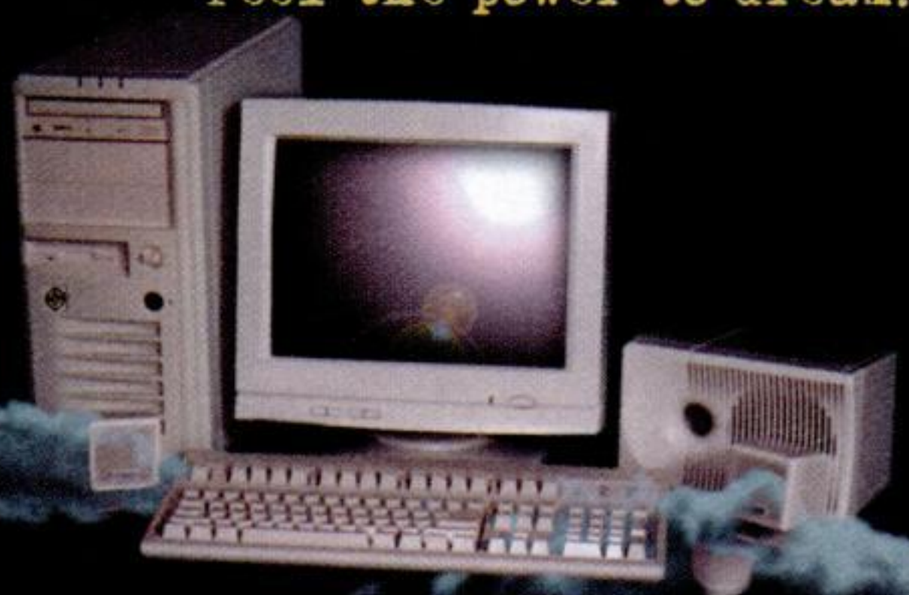

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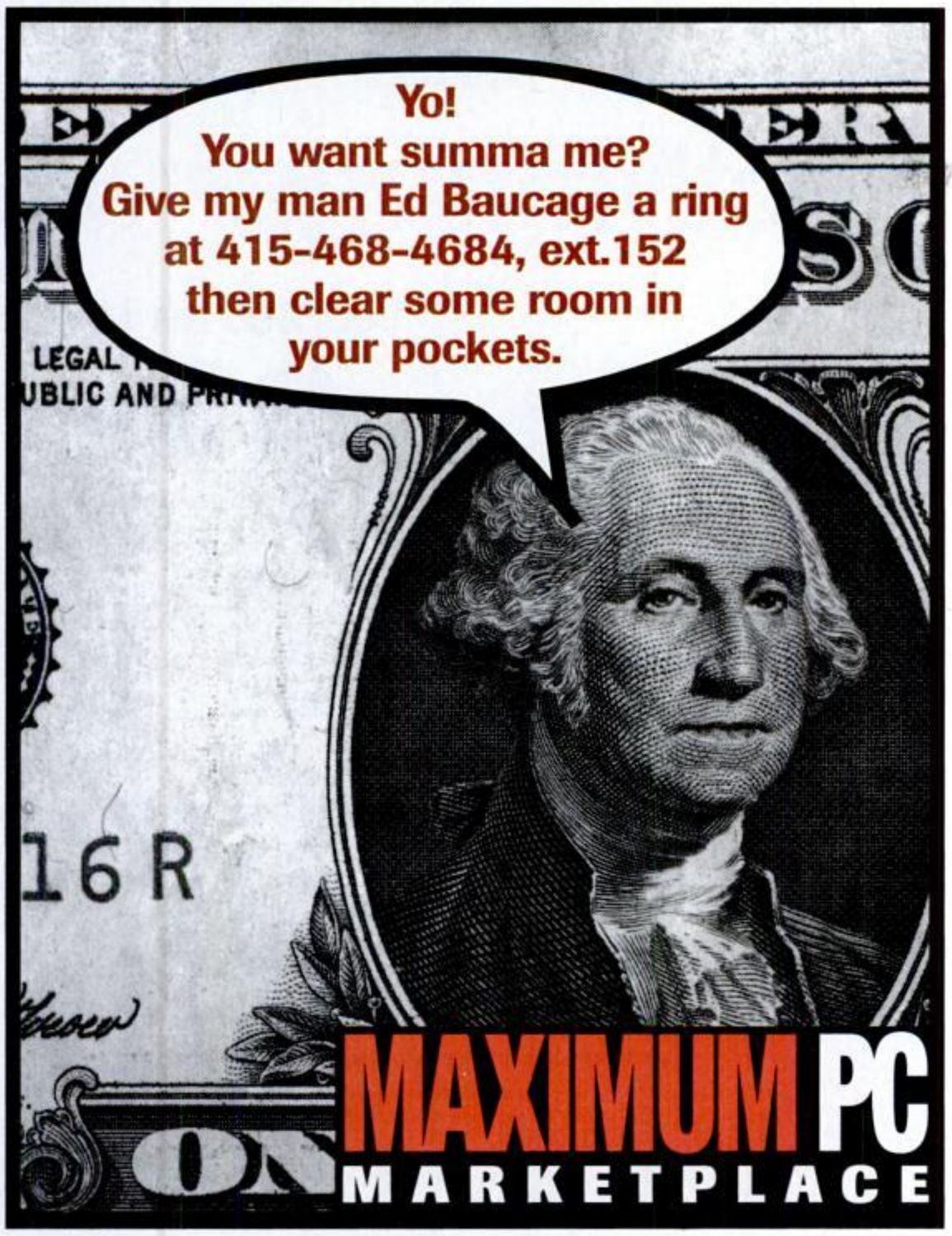

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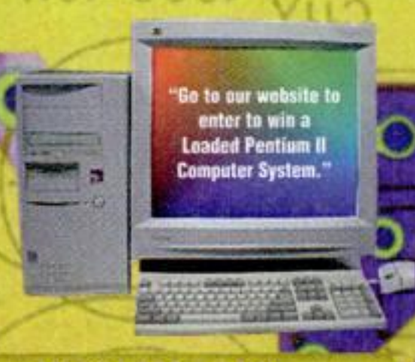

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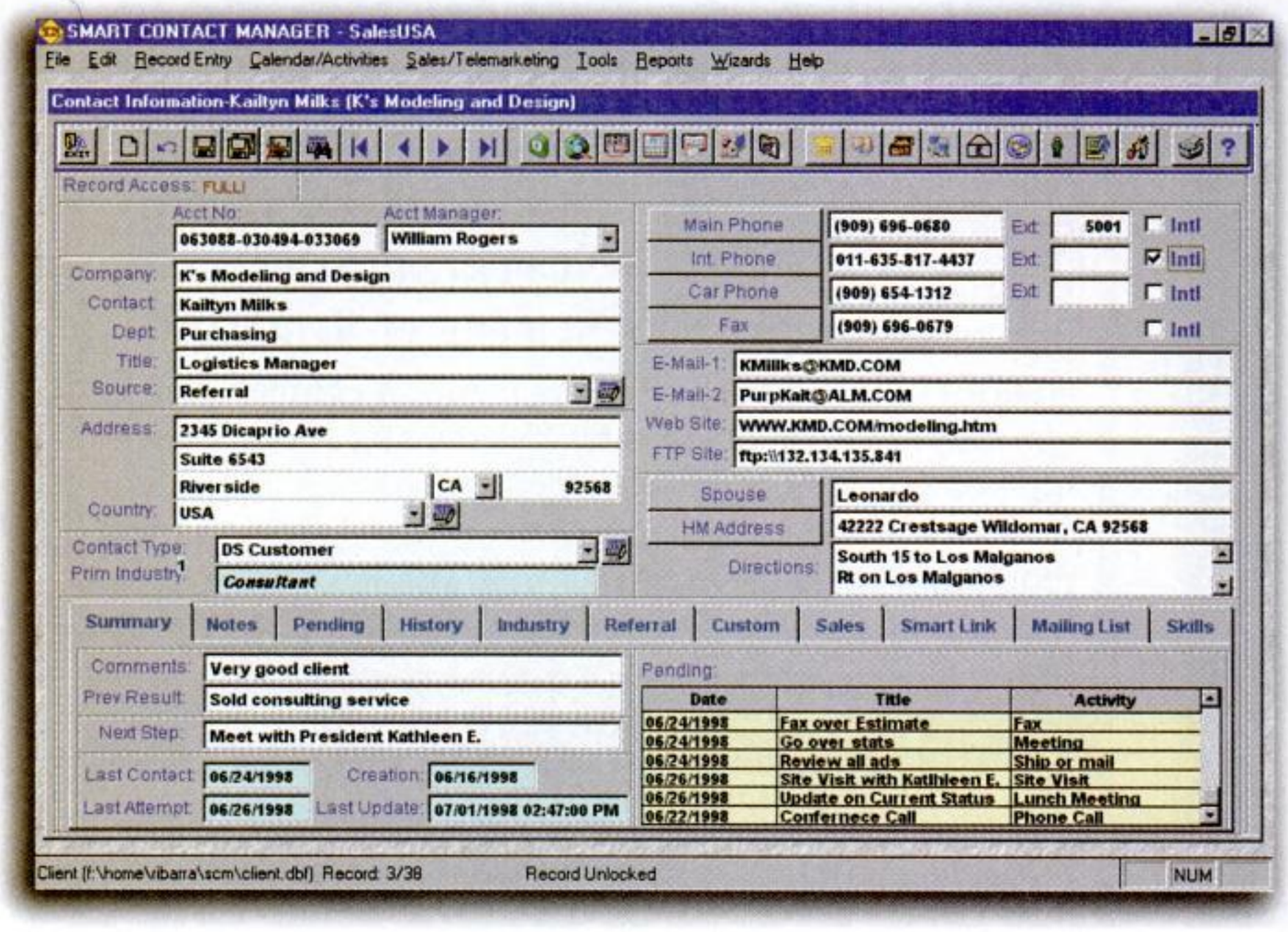
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Technical terms found throughout MAXIMUM PC are underlined and in blue. Hyperlink back to here for revelation and further explanation. The extended Terminator is also found online at **www.maximumpc.com**.

A

Accelerated Graphics Port AGP is an expansion bus developed by Intel specifically for the videocard subsystem. It operates independent of the PCI bus and normally runs at 66MHz (i.e., 1x). Whenever you see multipliers attached to AGP, such as 2x or 4x, they are referring to how much faster the bus will run—2x means 66MHz x 2, or 133MHz.

AGP See Accelerated Graphics Port

alpha-blend The ability to give a pixel a value that will render it solid, invisible, or partially transparent. The process is often used in games to depict special effects, such as explosions and weapon discharge. When mapped onto polygons, alpha-blending can simulate semi-transparent objects, such as water and glass.

Anime A term used to describe a style of Japanese animation (cartoon or otherwise) where people are drawn with big doe-eyes. There's also usually at least one of the following large human-controlled anthropomorphic robots; big space ships; ninja, samurai, or other martial arts; demonic entities that spurt tentacles and do really lascivious things with them; people with psychic abilities; cyborgs; or mysticism. The animation is highly stylized, and visuals are often very sharp and glossy. If you're familiar with Akira, Sailor Moon, Star Blazers, or Macross, then you know what we're talking about.

anti-aliasing A filtering technique that smooths out jagged edges on angled lines on a computer display.

API see Application Program Interface

Application Program Interface A set of programming protocols. Instead of a programmer creating custom codes to talk to an operating system directly, he or she can write an application to an API specification, and the instructions will be passed on to the operating system.

artifact Graphical flaw caused by the shortcomings of a compression technology. Often manifest as blotchiness in what should be a solid color.

ATX A motherboard formfactor that's smaller than AT, it's a standard configuration definition for most modern full-size desktop and tower PCs. Subsets of this include NLX, LPX, and MicroATX. There are numerous differences between the older Baby AT formfactor and ATX, including relocation of the CPU to an area closer to the power supply fan and concentration of I/O ports in one rectangular cluster. How do you know which one you have? Generally, an ATX-type machine will turn itself off after selecting shut down in Windows 95 or NT.

authoring pipeline The steps that artist-generated data takes from being created in a modeling tool to being stored in an appropriate final format that's read at runtime by a game engine.

B

bandwidth The amount of data that can be transmitted in a fixed amount of time.

BIOS Basic Input/Output System. Software that contains your computer's most rudimentary instructions on how the operating system communicates with hardware. Your BIOS runs at startup, configures devices, and then boots the OS. Because the BIOS is so integral to getting your computer started, it's stored on a separate ROM chip, not your hard drive, to isolate it from crashes.

branch caching To store specific or commonly-used instructions in a closely coupled cache in order to speed up performance and execution.

branch prediction Pipelining is the time-saving process that allows a microprocessor to decode one instruction while executing another. A branch instruction is the implementation of an "if-then-else" construct. If a condition is true, then the pipeline will jump to some other location; if the condition is false then it will continue with the next instruction. The longer the pipeline, the longer the whole process. Branch prediction speeds things up by allowing the processor to predict whether this jump will occur, based on what the branch has done in the past. If the prediction turns out to be wrong, the entire pipeline has to be flushed and all calculations discarded. But if the prediction turns out to be correct, time is saved, and everyone is the happier.

BSP Binary Space Partition. A way of dividing world geometry into a tree structure so it can be searched efficiently.

bump-mapping A visual trick that attempts to simulate a texture's roughness or smoothness, depending on how the texture reflects lights. In 3D, this is usually accomplished by laying two textures onto a polygon—a base texture for the graphics, and a second displacement texture that is mapped on the object. This second texture is used to determine how "rough" the surface will appear.

C

CF-2 Compact Flash 2. A postage stamp-sized industry-standard memory module.

client machine Also known as an end-user machine. Represents the performance limits that a game developer must keep in mind when designing the latest and greatest technology.

continuous level of detail A new way of representing 3D objects with a smoothly variable, instead of fixed, polygon count. Allows much more efficient and scalable use of processing power, as well as a general increase in framerate and visual realism.

control point The defining point of a vector line that contains control handles for setting the algorithm that determines the line's curve.

coordinate matrix A set of numbers required to draw a 3D object on the screen. Each object consists of numerous polygons, often triangles. Each vertex (corner) of each polygon needs a coordinate matrix to describe its location in virtual space. The coordinate matrix is usually a set of four numbers describing the horizontal, vertical, and depth positions of the vertex.

D

depth of field The range of distance that a camera can acquire objects in sharp focus—objects outside of this range will be blurred. An important cue and method for improving realism in computer generated scenes.

Direct3D A subset of Microsoft's DirectX Application Program Interface. This interface allows developers to use hardware acceleration for 3D graphics, which helps games run faster by offloading the 3D processing onto a dedicated piece of hardware.

double-precision floating point A floating-point number represented in a computer by 64 binary digits (bits). Commonly used in financial, scientific, and technical applications.

downsample Process of taking a file with more resolution and eliminating unnecessary data to achieve a smaller file.

dual voice coil Used to describe a speaker design where the manufacturer winds two sets of wires (the voice coil) in a speaker. Normally, a speaker uses only one voice coil, but in bass/subwoofer situations, a dual-voice-coil scenario helps with power handling.

dynamic attachment Attaching a skin (or object) to another object. Wrapping a soft skin around the skeleton avoids the problem of showing joints (holes where the pieces meet).

F

far field The area of a 3D scene that is far from the camera. 3D

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objects in this area will be smaller and details will be harder to resolve.

floating point A fractional number, such as 9.95 or 98.6. Computers have a more difficult time working with floating-point numbers than they do with integers (whole numbers), but the higher precision of floating point is required for some operations.

fps Frames per second. The number of times per second that a scene is redrawn to give the illusion of continuous animation. A movie is 24fps, a good game should be at least 30fps.

G

game engine A group of software routines that render polygonal models overlaid with texture maps in order to create the illusion of a gaming world in three dimensions.

gamma correction The ability to manipulate the gamma—red, green, and blue (RGB)—values of an image. This can affect how light or dark an image is.

gating item The limiting item, the slowest moving part that limits the performance of a system as a whole.

geometry transformation A math-intensive process that renders the skeleton of a 3D object on a screen. It makes heavy use of floating-point numbers and matrix multiplication.

H

hand animation Animation sequences that are scripted by an artist (by hand).

HID Human Interface Device. A Microsoft-specific term describing a USB device. You'll see this term when you hook up a USB device to a Windows 98 system via the USB port. The OS then loads the appropriate drivers, labeled HID.

I

IEEE 1394 Also known as FireWire in the Macintosh market. A high-speed bus protocol that transfers data at up to 400Mbits per second. 1394 is a great interface for digital video peripherals and may someday be used for high-speed modems.

integer A whole number, such as 1, 2, 3, etc. Computers can manipulate integers much faster and more accurately than they can manipulate floating-point numbers (fractions), but integers aren't precise enough for some operations.

integrated processors A processor that, in addition to the CPU core, offers additional functionality, such as built-in 3D acceleration or audio. Integrated processors generally offer a cost benefit, but the "everything but the kitchen sink" approach can sometimes detract from overall performance.

inverse kinematics A system of defining interrelationships between objects linked in a hierarchy. Each object is moved according to these relationships relative to the others. The "inverse" designation signifies that the last object in the chain is moved and the relative movement is computed from it up through the last or root object (highest in the hierarchy) rather than from the highest to the lowest in the chain (forward kinematics).

IRQ Interrupt Request. Unless coded to cooperate with each other, no two parts of a computer can access CPU cycles at precisely the same time. The sundry installed devices must therefore send Interrupt Requests to the operating system, asking for the processor's undivided attention. In modern computers, IRQ-dependent devices (e.g., keyboards, mice, soundcards) vie for interrupt priority among 16 different IRQ slots. If you need to install a new IRQ-dependent device but have run out of slots, you're out of luck, Bucky.

K

Katmai Intel's code name for a P6-series x86 microprocessor chip scheduled for introduction in early 1999. Katmai chips will have 70 new instructions for speeding up 3D graphics and other operations.

keyframe In animation, an image used at the beginning and/or end of an animation sequence as a reference point.

L

LANC Also referred to as Control-L, is a hardware/software protocol that lets your camera communicate with your computer or other Control-L equipped cameras.

M

Mecha An anime term that's used to describe any type of mechanized robot. When used by itself, it usually refers to a humanoid robot. When used in front of another noun (ie Mecha-Godzilla), it's used to describe a mechanized version of that noun.

matrix multiplication A mathematical process, commonly used by 3D graphics programs, in which the computer multiplies and adds two sets of numbers together. One set is the coordinate matrix and the other set is the transform matrix. The result of matrix multiplication is a new coordinate matrix.

meshes The computer representation of a 3d object. A collection of polygonal facets that approximate the surface of a 3d object on screen.

mip-mapping Technique used to generate scaled texture maps that involves creating sub-images sized for every inverse power of two i.e. 1/4, 1/16, 1/32, etc. The process of creating a mip-map takes time, and larger textures will require longer.

motion capture Animation sequences that are recorded from the motion of real people or animals.

motion compensation An algorithm that reduces shearing in DVD video playback.

multitexturing The process of applying multiple textures to polygons in a model.

N

near field The area of a 3D scene that is close to the camera. 3D objects in this area will be larger and details will be more apparent.

NTSC National Television Standards Commission. The NTSC is responsible for defining broadcast specificationss. If you're working on an NTSC video, you'll want to set your capture rate to 29.97 frames per second.

O

object popping The disconcerting effect when an object in a game suddenly switches between two levels of detail. Lowers the realism and interrupts the visual smoothness of a game.

OpenGL Open Graphics Language. An easy-to-use (for programmers anyway) graphics API created by Silicon Graphics. It's generally accepted in the high-end workstation market. In the Windows 9X world, OpenGL plays David to Microsoft's Direct3D Goliath or vice versa. It's a Chevy versus Ford debate with both sides locked and loaded.

output device Wherever computer files are viewed, whether it's a low-resolution environment such as the monitor or low-end printer, or high-resolution such as a laser printer or film imagesetter.

P

PAL Phased Alternating Line is the European equivalent to NTSC. If you're working with PAL video, you'll want to set your capture rate to 25 frames per second.

parallel The ability to process a number of different CPU instructions simultaneously.

PCI Peripheral Component Interface. 32/64-bit expansion slot/bus interface (running at 33MHz, or half the system-bus speed, and occasionally at 66MHz) developed to help break the slow 8-/16-bit Industry Standard Architecture (ISA) bus bottleneck, which ran at 8MHz. This faster bus allows faster data transfers, thus speeding up any input/output. Videocards, I/O cards, SCSI cards, and other high-speed devices benefit greatly from the PCI interface's faster speeds.

PCMCIA Type II Personal Computer Memory Card International Association. Small credit card-sized devices used mostly in mobile applications for such things as modems, hard drives and RAM. Also referred to as PC card. Type II calls for a maximum thickness of 5.5mm.

P6 Intel's code name for a sixth-generation x86 microprocessor chip. The Pentium Pro was the first P6-series processor, followed by the Pentium II, Celeron, and Xeon.

per-object polygon allowances The amount of detail allocated to various objects in a 3D scene. Without continuous level of detail, these allowances are fixed. With continuous level of detail these allowances can vary based on scene complexity and client-machine performance.

physics subsystem The part of the engine that understand how physics works. It is, ideally, an independent part so it can be replaced or upgraded without significant changes to the engine itself.

pipeline See authoring pipeline and rendering pipeline.

pixelfx2 A term specific to 3Dfx Voodoo^2 cards, it refers to a solo graphics processor chip that handles frame-buffer/z-buffer duties. At least two texelfx2 chips are needed for it to work properly in a Voodoo^2 configuration.

polygon count The number of polygons that make up a 3D

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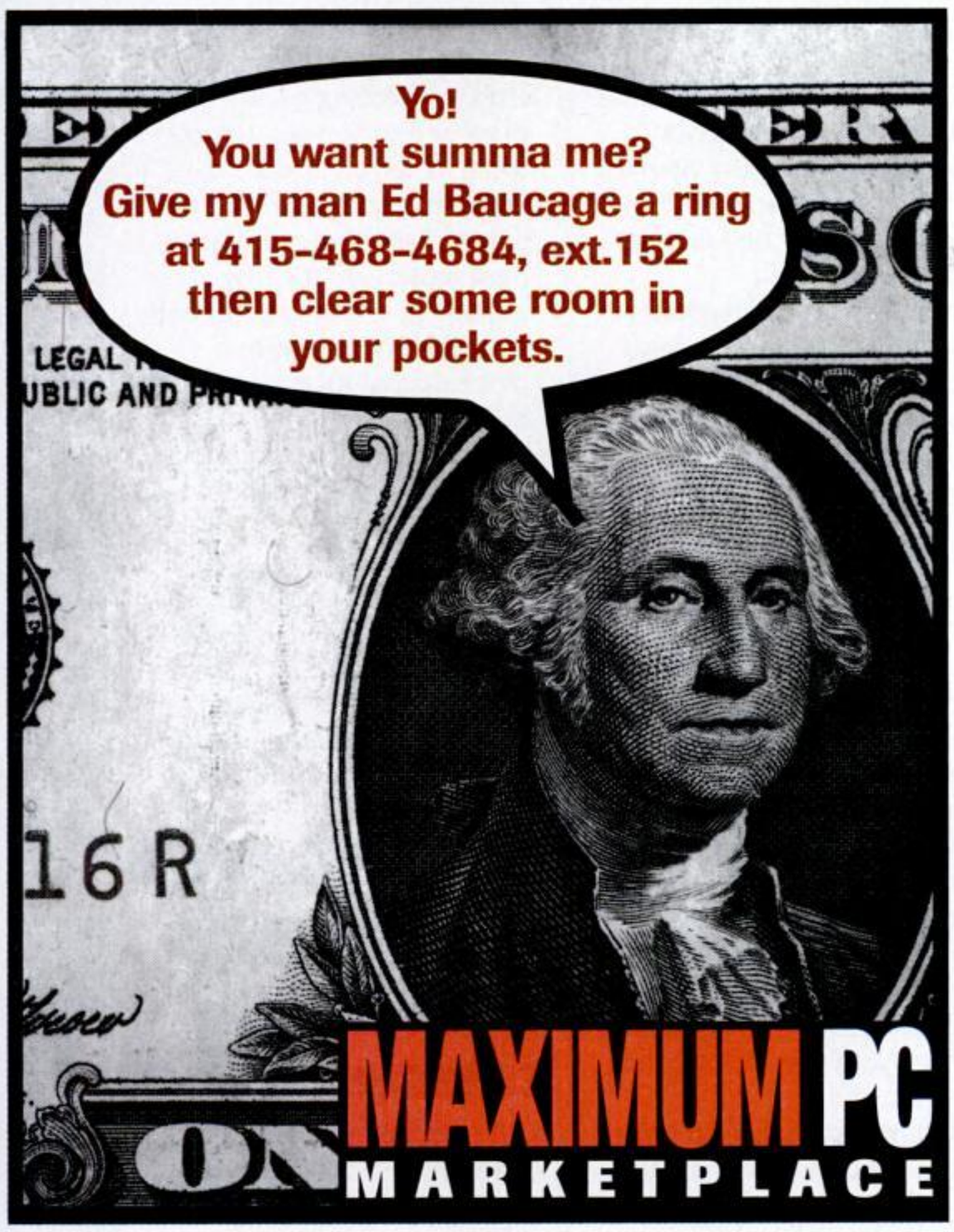

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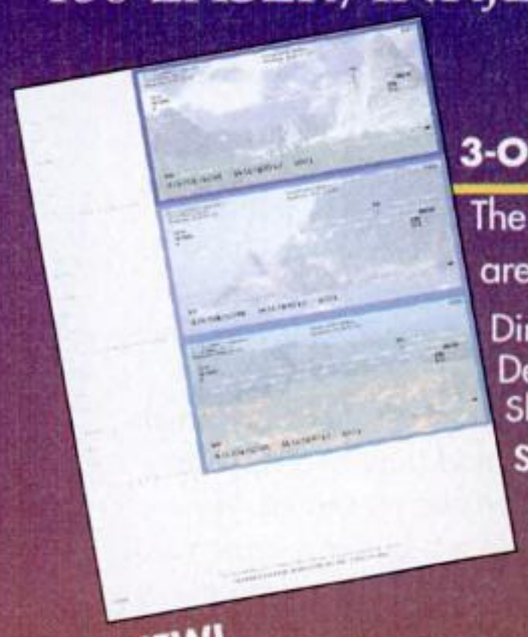

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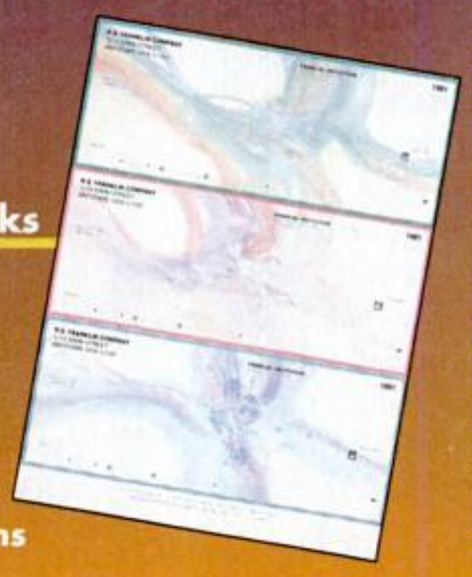

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object or scene. The more polygons, the more realistic, but the higher the processing burden.

polygon A 2D figure (usually a triangle or rectangle) that's the building block of a 3D screen object. It usually takes hundreds or thousands of polygons to form the skeleton of a 3D object.

POP3 Post Office Protocol 3. A standard protocol for sending and receiving mail on the Internet. Most internet service providers support this.

preprocesses The procedure that a programmer follows to convert regular 3D data into a special form that can be used with a continuous-level-of-detail system such as MRG.

R

RAMDAC Random Access Memory Digital to Analog Converter. The chip on a videocard that converts the bits of a digital image into an analog signal. It maintains the color palette and determines refresh rates. The faster the RAMDAC MHz, the higher the refresh rate your system can handle.

raster-based A fixed-resolution image comprised of a static Cartesian grid of pixels. These images cannot be scaled without interpolation that diminishes visual quality.

rasterizer The final stage of the rendering pipeline where the pixels get slapped on the screen.

ray intersection primitive A function to throw a ray (a vector) through a set of geometry (such as a BSP tree) to see what intersects it. It is very useful for dynamic lighting (start the ray at the light source and find the surface it hits), collision detection, visibility testing, etc.. Much functionality is built on top of this primitive, so speed is everything. Speed limits how much dynamic lighting you can do, how many shadows you can cast, how much collision detection you can afford, etc.

realtime Immediate or concurrent response. It refers to commands or actions that happen in a computer on the same time scale as in the physical world.

rendering pipeline The steps that data must take from being stored as a file on disk to being *drawn in realtime on screen*. Some of these steps are performed in software, some in hardware. 3D accelerators speed up this process.

runtime During a program's execution. A runtime error occurs while a program is running.

S

SDRAM Synchronous Dynamic Random Access Memory. It is a faster type of memory that synchronizes with the CPU. Its architecture allows it to run fast enough to handle the 100MHz system bus.

SGRAM Synchronous Graphics Random Access Memory. A type of single-ported memory often used for videocards that synchronizes with the CPU and uses techniques to optimize graphics processing. Considered faster than its SDRAM cousin due to its ability to perform mask writes and block writes.

single-precision floating point A floating-point number represented in a computer by 32 binary digits (bits). Commonly used in 3D graphics.

skeletal animation Representing characters (and objects) as a heirarchy of bones.

sneaker net Transferring data via removable storage discs; the act of physically walking from one computer to another and popping in a disc.

streaming 3D 3D data sent progressively over a network, such as the web. Allows the user to experience 3D without having to wait for the whole file to download. It's analogous to RealAudio for audio. Also good for rendering huge 3D worlds off of a CD.

T

texel Short for TEXture ELement. Refers to the individual pixel that makes up a bitmapped graphic that'll be used as a texture when it's applied on a polygon.

texelfx2 A term specific to 3Dfx Voodoo^2 cards, it refers to two graphics processor chips that handle texture storage and processing duties. At least one pixelfx2 chip is needed for it to work properly in a Voodoo^2 configuration. Since Voodoo^2 has two of these texelfx2 chips working in parallel, this is considered a dual graphics pipeline capable of performing multitexturing in a single-render cycle.

texture-mapped A 3D object that has an image wrapped onto it to represent its surface. It is the principal way that 3D games fake realism. Virtually all new 3D games rely on texture mapping.

1394 Also known as FireWire in the Macintosh market. A high-speed bus protocol that transfers data at up to 400Mbits per second. 1394 is a great interface for digital-video peripherals and may someday be used for high-speed modems.

3DNow! 21 new instructions in x86-compatible microprocessor chips from AMD, Cyrix, and Centaur. The instructions speed up 3D graphics. Intel's new Katmai instructions are similar to 3DNow! but are more comprehensive.

transform matrix A set of numbers required to redraw a 3D object on the screen. When an object moves, or when the user's viewpoint of the object changes, the computer must redraw the object. It starts by recalculating the coordinate matrix for every vertex, using a process called matrix multiplication. Usually the transform matrix is a 4x4 arrangement of 16 numbers and the coordinate matrix is a 1x4 set of four numbers.

triangle setup It's the processing that occurs before a triangle can be rendered. It's a significant amount of processing. The previous generation of 3D hardware required the CPU to do this work. The current generation off-loads this from the CPU.

triple-buffering A technique that allows a videocard to set up three mini buffers within frame-buffer memory. This allows multiple output frames to be rendered and processed. Double-buffering is a technique where one buffer is used while the second buffer is filled with information. Triple-buffering adds a third buffer to the mix.

U

USB Universal Serial Bus. A new, faster, digital I/O port proposed by Intel for motherboards. Taking up far fewer resources, this port can act as a serial, parallel, mouse, keyboard, joystick, and even speaker interface. Unlike other communication ports on a PC, USB can be daisy-chained up to 127 devices.

V

vector-based Vector-based graphics are static graphics, animations, and fonts created as mathematical descriptions, consisting of a collection of lines, curves, and shapes.

vertex A corner of a polygon used to draw 3D graphics on the screen. Polygons are usually triangles or rectangles, which have three or four vertices, respectively. When an object moves, or when the user's viewpoint of the object changes, the computer must recalculate the new position in virtual space of each vertex. It does this with a process called matrix multiplication.

vertex-based animation An explicit polygonal mesh to represent each keyframe.

VGA VGA refers to your computer monitor. An NTSC monitor refers to your television monitor.

VGA-output The ability to send your Video Graphics Array output or video out to an external monitor.

W

Windows CE A reduced-function Microsoft operating system for HPCs, set-top boxes, and embedded applications.

X

x86 A microprocessor architecture invented by Intel and widely copied by other companies. The 486, Pentium, Pentium Pro, Pentium II, Celeron, Xeon, AMD K6, Cyrix M II, and Centaur WinChip are all x86-compatible processors. The first x86 chip was the 8086 in 1978.

Z

z-buffer In a 3D videocard, local video memory is often used to form a frame-buffer, which stores all sorts of data required by a 3D card in order to properly render a scene onto your monitor. With the advent of texture-mapped polygons interacting in a 3D world in realtime, the need to have a buffer with which to track positioning became a necessity. A z-buffer stores the z-axis value (front to back) of a pixel on-screen—this value is compared with incoming z-value data to determine whether the pixel will be drawn or not, and how overlapping pixels will be presented. How accurate a z-buffer is dependent on how the 3D accelerator handles z-buffer calculations, and how much memory is allocated to it. Higher color-depth rendering requires more z-buffer memory, as the amount of pixel information is made larger with more color usage. It speeds up 3D gaming by not rendering the parts of a scene that are obscured by other objects.

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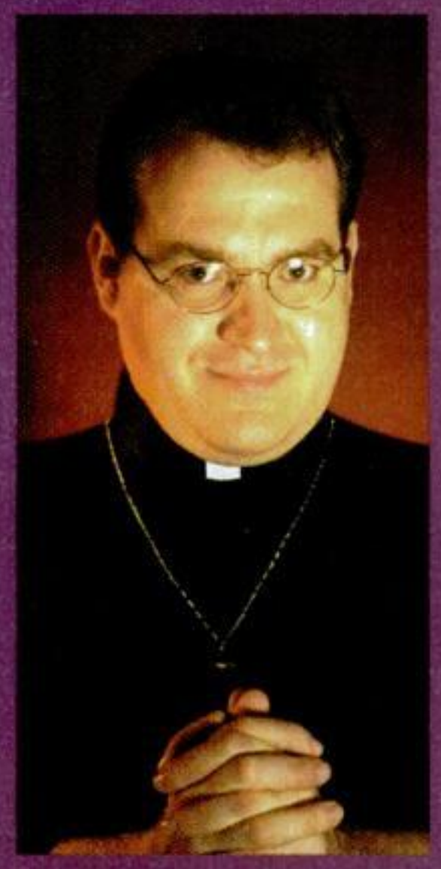

ALEX ST. JOHN was the architect of DirectX while an evangelist at Microsoft. Since leaving the empire, he has remained a player, brokering many deals in the industry. Reach him at **saint@maximumpc.com**

As the galactic hub of the software universe, Microsoft draws most of the monopoly accusations, but scattered among the stars is dark matter that constitutes the vast majority of manipulative mass. This is the story of another budding empire, an ambitious mote that believes it too will accrete into stars one day, with the successful application of diabolical gravity on its nearest neighbors.

Consider little 3Dfx: It built superior technology and gathered a following early in the 3D revolution. Like so many hardware companies, it learned quickly that shipping stable drivers that support industry standards—while good for its customers and the market—was not necessarily in its own best interest. As Matrox, nVidia, and Rendition failed to penetrate the consumer 3D market, 3Dfx emerged with the first Voodoo chipset. And with that came Glide, a simple, clean API that game developers could use to quickly add hardware support to 3D titles. Although Microsoft's Direct3D API had been on the scene for some time, it was rough around the edges, harder to code to, and had made architectural compromises in order to support many 3D chipsets.

Knowing it had a technological lead on the industry, 3Dfx dragged its feet on supporting D3D, while protecting its own API by not licensing it to other hardware vendors. After all, its lead couldn't last forever, and when it was gone, the only thing between 3Dfx and a meltdown would be the body of games that worked exclusively on its hardware.

Empire in Training

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So 3Dfx took other precautions.

At a time when U.S. arcade operators desperately needed content, 3Dfx could have taken a leadership role in pushing an open platform for PC game developers to enter that space. Instead, 3Dfx's sister company, Quantum3D, pursued a proprietary strategy that ultimately produced nothing and contributed to the fragmentation of industry initiatives.

Then there was the deal with Sega. nVidia had closed a deal to provide its integrated 3D solution, the NV-1, for the next Sega game console, the DreamCast. Unfortunately the NV-1 didn't fare well on store shelves, in spite of shipping with *Virtua Fighter*. nVidia went back to the drawing board. 3Dfx had its 15 minutes of fame, but it was next to discover the meaninglessness of a Sega contract. 3Dfx, too, was sure it had sewn up a deal to be the 3D chip for DreamCast, and it, too, was shocked to learn that Sega had dumped its chip, this time in favor of NEC's PowerVR chip.

Now, with the arcade a fading dream, the console gone, Intel shipping great 3D acceleration on the motherboard, lots of competitors with superior solutions, and the holiday shopping season rapidly approaching, what is 3Dfx to do? Aside from the obvious solutions—such as suing its nearest competitors for anything it can think of and desperately dragging its feet on releasing updated D3D 6.0 drivers, which can now support nearly everything its chips can—it has hit upon an effective butt-saving strategy.

Check out your local Babbage's or Software Etc., and you might notice a special section devoted exclusively to Voodoo titles. Fair enough, you say, 3Dfx has persuaded many developers to optimize for Glide, some even require 3Dfx exclusively. Why shouldn't these stores create a special section? Look close and you'll find games, such as *Star Wars: Shadows of The Empire*, with large red labels that read, "WARNING! 3Dfx REQUIRED!" Check the system requirements on the box, however, and you'll find that they also support Vérité, Permedia 2, and any other D3D-compatible chipset. The label even appears on Microsoft's *Flight Simulator* and *Motocross Madness*.

Why would publishers allow 3Dfx to plaster warning labels on games that actually support a broad variety of 3D accelerators? It turns out they didn't. But they found out about it very quickly after sales dropped off suddenly.

I think 3Dfx deserves a round of applause for this maneuver. It has successfully fragmented the already difficult-to-support PC market, and screwed millions of consumers and game developers in the process.

I sped to my local Software Etc. to collect some of the games with these labels. Already the red-labeled boxes were being replaced with ones bearing a less inflammatory green label reading, "WARNING! THIS GAME ENHANCED BY 3Dfx!" I asked the guy at the counter about the creative labeling, causing him to cringe. "You're another guy from Microsoft aren't you," he yelled. "I told you guys my boss made us put them there!" Apparently the problem was already being "resolved."

3Dfx successfully fragmented the already difficult-to-support PC market, and screwed millions of consumers and game developers in the process.

Tucking copies of the "creatively labeled" games under my arm, I headed home, noticing the Milky Way was especially clear that evening. And wondering if the distant blinking lights of a jet taking off from Sea-Tac airport contained one of the many Microsoft executives winging their way to Washington D.C. that weekend to be deposed for anti-competitive practices.

For definitions of Terminator words, hyperlink to the back of Maximum PC, or check out the Terminator online at www.maximumpc.com.

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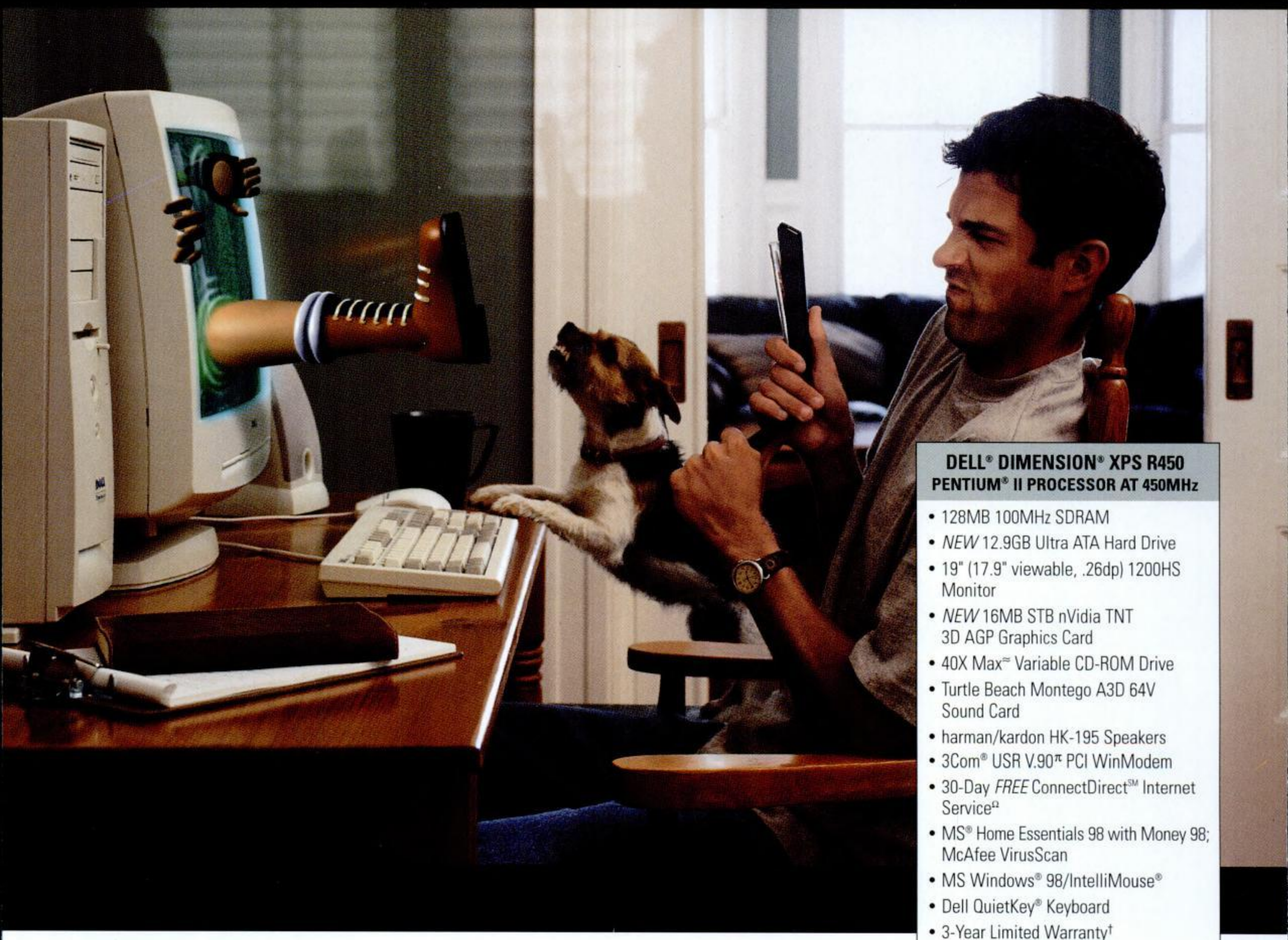

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